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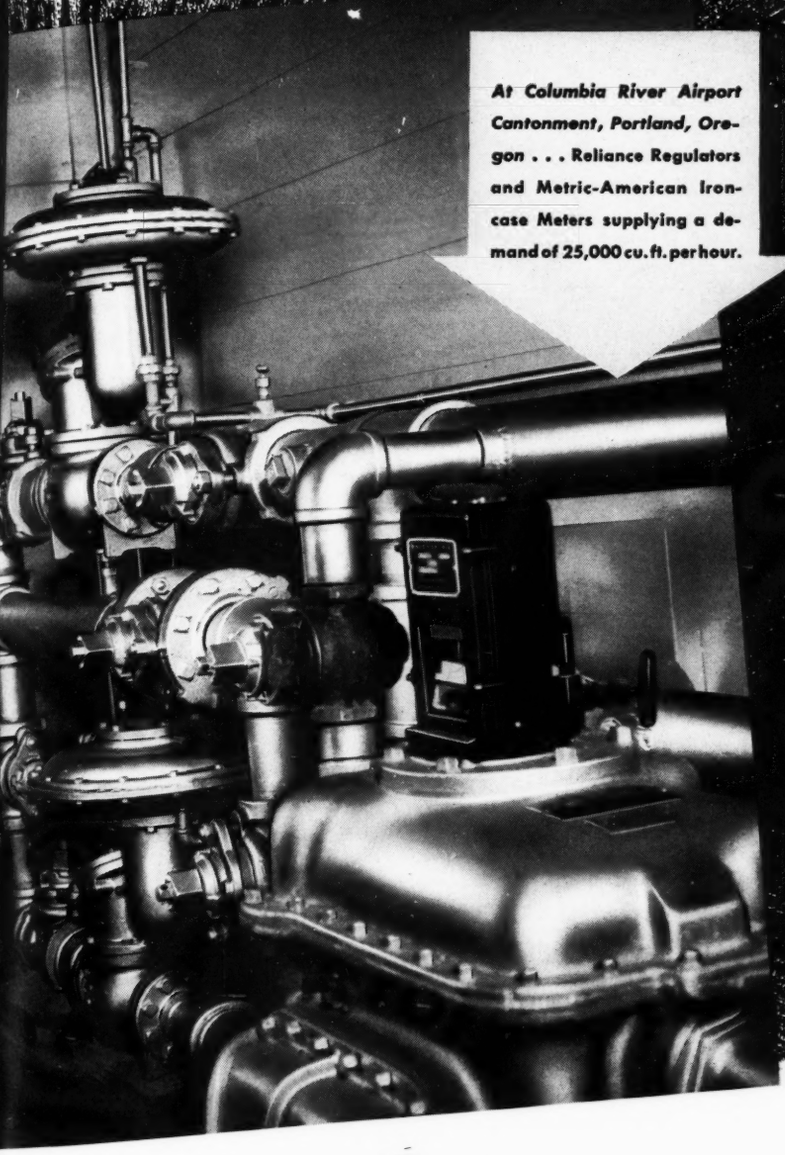

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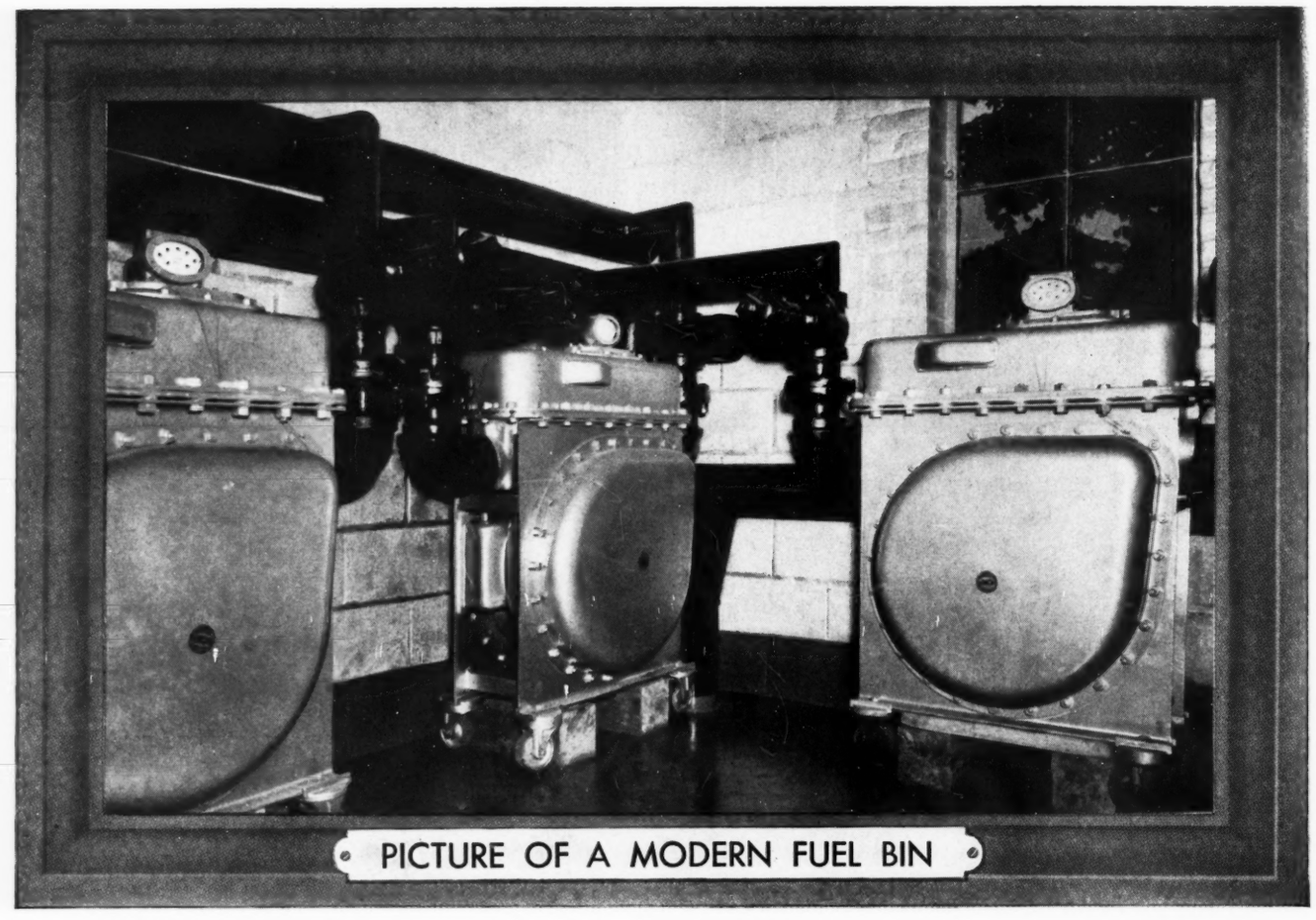

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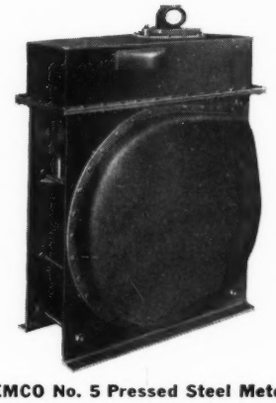

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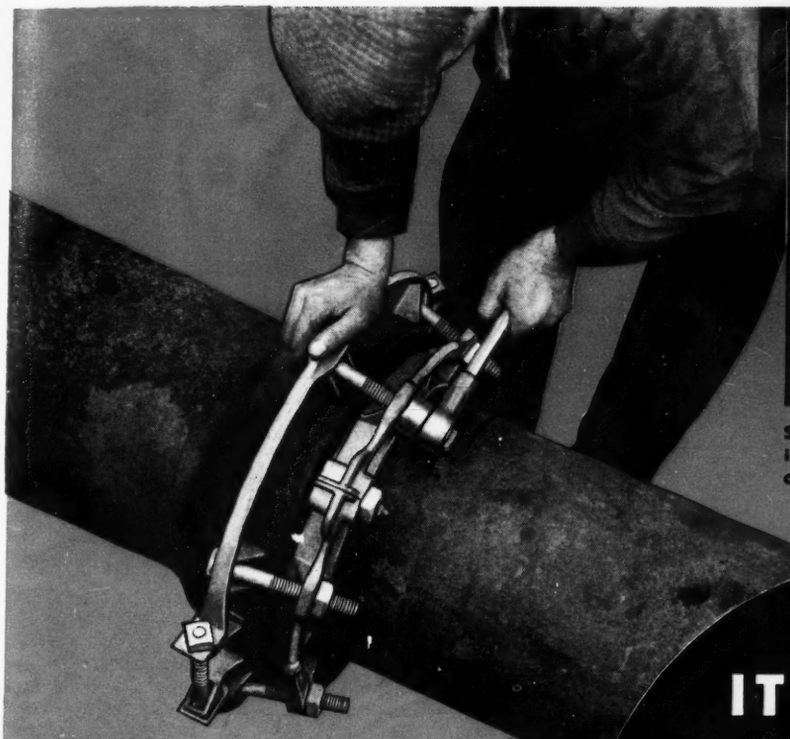

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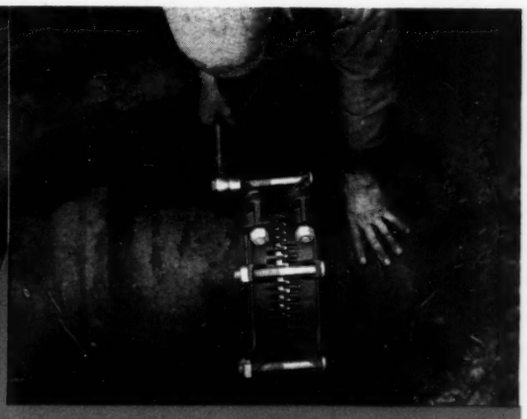

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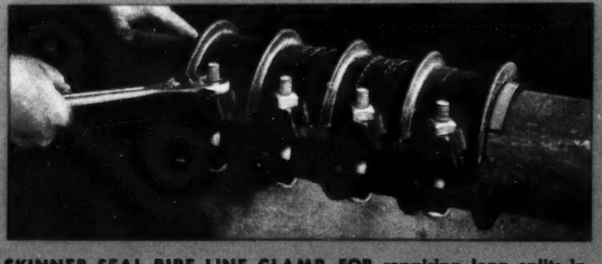

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Seventeenth Year of Publication

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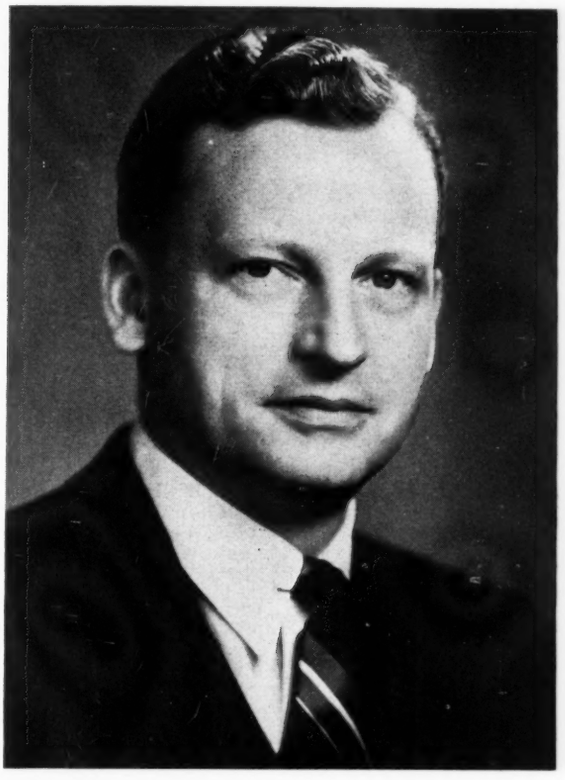
GAS
SEPTEMBER, 1941

GUEST Editorial

PARADOXES and PROSPECTS

By ROBERT A. HORNBY

President, Pacific Coast Gas Association
Vice President, Pacific Lighting Corp., San Francisco



CONVENTION time is usually boasting time, and although boasting may be vacuous, it is a harmless procedure because it seldom injures the recipients. To the extent that virtues and achievements are enumerated, boasting may be useful, as these are the things to be repeated. However, in this disordered, fearsome stage of history, boasting of one's past achievements seems not only idle, but fatuous.

Practically everything that was being striven for yesterday is being denied today. Unemployed men, money, and machinery are disappearing. Unemployment is being replaced by unmet demands for skilled labor. Artificial curtailment of food is now being abandoned for the creation of surpluses—more hogs, more wheat, more tobacco, more everything. Yesterday the country was overbuilt with too many factories, too many machines, and too many products, and anything that was big was bad. Now today's large factories must be made larger tomorrow. In fact, industrialists are accused of shortsightedness by failing to provide these larger plants. In the middle of the late unlamented 30's, those who undercut their competitors in quality or price were branded as chiselers, and associations were formed under the Blue Eagle to stop it. Such associations may now be subject to prosecution for conspiring to restrain trade and prevent price cutting.

Bright still is the memory of the time when the country's financial agencies were being upbraided for failing to extend cheap credit on long terms. Today, installment terms are evidently too long and home loans too easy, and there are to be tighter policies. Buying, which once was being encouraged, is to be discouraged by natural and artificial means.

Deficit government financing to redistribute national wealth and liquidate the middle classes and John Maynard Keynes' theories of insolvent economics were the criteria for all long-term planning. The middle classes are now to produce the bulk of the taxes of the Gargantuan levies ahead. Savings accounts are no longer looked upon as an evil block upon progress. On the contrary, there is talk of forced savings. Government coercion to force workers to join unions was to bring lasting industrial peace and greater benefits to the individual workman. Now emergency facilities are being created to dissuade union leaders from striking, seizing property and stopping production, and there is talk of legislation to protect workers from labor racketeers. But a short time ago the 30 and 36-hour weeks were supported as the length of time men should devote to the production of goods, services and things. Now there is great concern over the nation's inability to produce sufficient quantities of guns and butter with men and machines working only 40 hours a week.

During the past decade, young and old were being indoctrinated in the total failure of men, morals and machines, and in the acceptance of a world completed. There was to be permanent relief and charity, continuous subsidizing of youth and old age, enforced recreation, socialized entertainment, a scale of living set by mediocrities, and an acquiescence in the omniscience of the mind in a government job. Most of these cures for the defeatist view were borrowed from Europe, a land where the promises men live by are lightly discarded when expedient, and yesterday's allies are cavalierly attacked today —as witness Hitler's murderous assault on his partner in crime, Joseph Stalin. Some continue to look to revolutionary Europe for the pattern of their future conduct, but the great majority of the people in these United States point to the fact that before we can have peace we must crush the venal men of Europe and their opportunistic nostrums. The majority say we have eloquent proof of the stupidity of the curse and the cupidity of their exponents, and that once again we have proven that if we want the best things in the largest quantities over the longest time we must get them through a system of reward rather than through a tyranny of compulsion.

Thus this 1941 Convention time finds us in a world of accumulating paradoxes, but with encouraging prospects for the future. Evidently the defeatist tenets of a world completed and futility of our way of life are no longer acceptable to us. Hence we propose to get along with our No. 1 job of rearmament of the nation and the defense of free peoples. While so doing we shall reacclaim the ideals on which this nation was founded and review the past and look to the future as free men. We hope you will be with us and make your contribution to our deliberations at Del Monte.

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THERMALLY *Thinking*

A Responsibility Accepted

WHEN winter comes many defense industries will be in the full swing of production, and the natural gas companies who serve these industries under special low-rate contracts are faced with a grave responsibility. Ordinarily under the peak load conditions of winter, the utility would temporarily cease service to such industrial consumers in order to safeguard the domestic user, but these days the National Defense Program comes first, and it is the responsibility of the utility to make certain that neither its domestic market nor its industrial consumers are left without fuel service this winter.

As an example of the acceptance of this responsibility the Southern California Gas Co. through Vice President F. M. Banks has, in cooperation with the California Railroad Commission and the California State Council of Defense, issued a warning of the portending shortage of natural gas and has asked that all industrial consumers, if they have not already done so, fortify themselves with standby fuel service.

United Front

WE HAVE it on the good authority of the American Gas Association that defense priorities will not seriously affect the production of gas ranges during the remainder of the current year; and that there is every indication now that the year's production will not only exceed that of 1940, but will be the biggest in the history of the range industry.

Unquestionably, the newly released consumer purchasing power incidental to expanding defense activities has resulted in a buyers' rush for many types of consumer goods, and so long as the stove industry can keep up the pace it can expect to make new records in sales.

But it would be living in a fool's paradise not to recognize that the gas appliance industry along with all other industry is face to face with an impending shortage of materials, whether or not the pinch is being acutely felt at present.

To date the simple formula in Washington has been to allot to the defense industries whatever materials they needed, leaving the surplus to filter down to the non-defense manufacturers in whatever haphazard apportionment individual demands and insistance brought about.

Small manufacturers are already beginning to feel the shortage, and the cry of the moment is that little business faces almost certain extinction unless provisions are made for its members to receive at least a portion of their requirements commensurate with their relative volume of business in normal years.

About half of the steel tonnage for 1942 will be absorbed either directly or indirectly by defense manufacturing and construction. It is officially estimated that non-defense shortage for 1941 will total 11,000,000 tons, while that for next year will be far greater.

The shortages in other critical metals, ranging from aluminum to zinc, are all being felt, and the acute crisis in many of these is regarded as only a matter of weeks off.

While the gas industry as a primary supplier of fuel has been placed on an allocation program which promises reasonable assurance of materials needed for maintenance and repair of plants, pipe lines and transmission equipment, it is well to recognize that the maintenance of existing send-out facilities is not enough to keep the non-utility factors of the industry alive.

Every manufacturer of gas appliances and gas-burning equipment is part of the gas industry. It is in no small measure due to the inventiveness and the ingenuity of these manufacturers that gas has come to be universally accepted as the most desirable fuel. It is they, far more than the gas utilities, that have been keenly alive to changing public demands for new models and new conveniences, all of which have combined to multiply a thousand fold the sales arguments for gas as a fuel.

It is being demonstrated daily in the workings of the practical politics with which all defense endeavor is intermixed, that those industries that fight the hardest, and the most intelligently for their rights are the ones that are being given consideration by the authorities in the government.

In the present crisis the problem of a fair allocation of materials to the manufacturers of gas appliances is as much a problem of the gas companies as it is of the stove and furnace companies. It must be accepted as a joint responsibility and its equitable solution vigorously pressed by utilities and manufacturers in a united front.

Six Little Words

SEVEN times have the people of San Francisco gone to the polls to decide whether or not they should go into the business of distributing electric power. Each time the decision has been, NO. And the last time, in 1939, a $55,000,000 proposed bond issue was defeated by 2½ tol.

Yet, today the people of San Francisco and the Pacific Gas and Electric Co. are faced with an eighth election to be held in November. Briefly the story is this:

Many years ago San Francisco built a municipal water system, selling the by-product power to a local private utility. Then socialized power advocates obtained a court decision under the Raker Act, which granted the city the use of the Hetch Hetchy Valley in Yosemite for a municipal water system and which prohibits the city from selling its power to a private utility for resale. In April, 1940, this decision was upheld by the U. S. Supreme Court.

Secretary Ickes outlined two courses: (1) the city could lease the P. G. and E. electrical properties; (2) the city could buy out the P. G. and E. or build a competitive system. Two leases were

Booklet on Summer Air Conditioning Equipment

In this issue of GAS, James E. Patterson, of the Carrier Corp., contributes the seventh and concluding article in a series on gas-fired summer air conditioning equipment. This series which has described in detail the operating principles and sales potentialities of the equipment of the Bryant Heater Co., the Williams Oil-O-Matic Heating Co., Pittsburgh Lectrodryer Corp., Surface Combustion Corp., Mills Novelty Co., Servel, Inc., and Carrier Corp., has offered to the readers of GAS a compendium of information on air conditioning. If there are enough requests, GAS will reprint this series of articles in booklet form for distribution to the industry at a nominal charge. Please send in your request for copies of this booklet within the next 20 days to GAS, 1709 West Eighth Street, Los Angeles, Calif.

prepared. Secretary Ickes turned down both. The city faced a loss of $2,400,000 a year in income, the average amount paid it for power by P. G. and E. So the bond election was decided upon, and the Federal Court agreed to let the present illegal contract run until July, 1942, pending the outcome of the election.

To this plan Secretary Ickes agreed —but demanded the signing of amazing stipulations:

The Mayor, Board of Supervisors, Public Utility Commission, Manager of Utilities, and the City Attorney of San Francisco, had to agree to make every effort to persuade the voters to approve a public ownership power program to be voted on an eighth time, at an election to be held in the first week of November, 1941.

They had to pledge themselves to attempt to obtain the support of civic groups and the public press.

They had to agree to purchase radio time and newspaper space to present arguments in favor of the bond issue (nothing against it) and issue a pamphlet to be sent all voters urging its adoption, and to not present the other side of the case. This pamphlet had to meet with the approval of the Secretary of the Interior.

In connection with the forthcoming election, the City has prepared a plan known as Plan Nine, which the Secretary has approved. While P. G. and E. engineers have not yet made a complete analysis of Plan Nine, a few of its claims are outlined in a letter from A. C. Joy, P. G. and E. Advertising Manager.

"Plan Nine is a political document as much as it is a plan to acquire the system. It makes extravagant claims even to the point of reducing rates by 30% and still making a huge profit. It claims that out of a gross of about $16,500,000, it will have a net profit of $8,267,000 at current rates. In other words, it will return the City more than 50¢ in profit out of every dollar of revenue. The private utilities would be interested in knowing how that can be done. It makes utterly false statements regarding rates. It says if the bonds are not carried the Federal Government will take over the Hetch Hetchy power properties and operate them as a part of the Central Valley project. This it happens cannot be done, as the Raker Act carries no forfeiture penalty. The Act does permit the shutting down of the plant. That might be done, but would it be done in the face of the 'power shortage' cry? And if it is not done by the City, what agency can do it? And whatever that agency might be, the City would be entitled to just compensation for the power. The United States Constitution guarantees this.

"Opposing Plan Nine, we shall ask for amendment of the Raker Act. The Government has not a nickel of investment in Hetch Hetchy. Original value of the Hetch Hetchy Valley was appraised at $250.000. The City has spent $1,500,000 in Park improvements in the immediate area, largely roads, so the government has actually profited by about $1,250.000. In all the other big government-financed power projects, where millions upon millions have been laid out, provision is made for sale of the power to private utilities. P. G. and E. is actually buying power from the government's little plant in Yosemite Valley. But Secretary Ickes will make no concessions on Hetch Hetchy.

"There is no reason why the Raker Act cannot be amended, save that Ickes has said it cannot. If the bonds are defeated, even if his opposition should be withdrawn, it would be senseless to shut down the plant in the face of public sentiment and the demand for power when the whole problem can be solved with an amendment changing a half dozen words."

Here indeed is a ludicrous commentary on the complexity of modern existence. By the changing of six little words the people of San Francisco might be spared the expense of an election on a matter on which they have already seven times expressed a decided opinion; the possibility of an unnecessary power shortage might be averted; the Pacific Gas and Electric Co. and its personnel might be freed from playing in politics and to devote their time to the essential task of the moment—the production and distribution of power and fuel.

To look at the problem in its broadest aspects, it is apparent that the people of the United States have already lost those freedoms which even now they are so earnestly working to defend. For when has an appointed official of the Federal Government had the power to dictate in such a manner to elected representatives of the people? Are not such officials as much to be feared and hated and destroyed as are the vandals of Europe?

Gas an Essential

WITH the ink from the Presidential pen scarcely dry on H.R. 4816, the pipe line bill, there came a news story that 11 oil companies had joined resources, and presented to Secretary Ickes a plan for constructing an 1820-mile line to serve the Atlantic Seaboard and for financing its estimated cost of $80,000,000 through private sources.

Administration gauleiters who have been so prone to accuse industry of failing to measure up to the demands of national defense might well consider the promptness with which this offer was made, and the fact that it involves not a pious hope, but a definite and tangible plan for the consummation of the entire project.

The natural gas industry, too, should mark well the wording of the bill which authorizes the construction of necessary pipe lines for any "petroleum products," and which in the opinion of most authorities would be construed to include natural gas.

Evidence is not wanting that natural gas is sorely needed by defense industries that do not at present have access to sufficient quantities for their expanding production requirements.

Under these circumstances we believe that the whole question of the essential need for natural gas pipe line extensions should be pressed before the proper authorities to the end that a presidential proclamation be issued specifying those proposed lines that are to be regarded as essential to national defense.

The natural gas industry cannot remain satisfied with having its status in the defense pattern defined by the coal and railroad interests who have arrogated to themselves the position of spokesmen for an industry whose progress they have consistently and persistly attempted to obstruct.

More Than 5000 Copies This Issue

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Mr. THERM'S RATIONAL RATIONING
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SAVE WOOD AND PAPER THIS EASY WAY

Front covers of booklets issued by the British gas industry to aid in the war effort.

Letters From London

THE trials and triumphs of the British gas industry as it has doggedly gone about its daily task of serving the defense industries and densely populated cities of England under the wrath of the Nazi Blitz is a story of heroism and heartbreak, of determination and ingenuity, of an undaunted spirit that treats a threatening bomb with that disdain which you or I might give an annoying insect. But an insight into conditions in England is far more feelingly set forth in a letter which has been received from H. Staniforth, executive director of *The Gas Times*, a weekly journal published in London which serves the industry in England. His is a message that at once reveals the indomitable spirit of the British and gives a warning — a warning to foresee and to be prepared. Mr. Staniforth's letter:

Arthur Rohman, Esq.,
Managing Editor, *GAS*,
Los Angeles, California.

Dear Mr. Rohman,

Delay in replying to your kind letter of the 25th. February is in part due to the long time taken by your letter in transit and in part to awaiting the arrival of the copies of the January issue which you mention.

We fear that Davy Jones is by way of becoming a gasman, for *GAS* has not reached us since the end of last year.

Meantime, it was a pleasure to try to meet your request for copies of the war-time publications (see illustrations)—and these were dispatched to you right away on receipt of your letter. I trust that they reached you safely.

Please do not fail to call upon us at any time if perchance we might offer any small help in return for the many courtesies—sometimes taken for granted — that we have received from your end. It is a real pleasure to us to co-operate with our gas friends the world over.

I have for long planned to write an article for you, as some sort of return, on gas under war conditions. The smaller difficulty is to know what to leave out for reasons of national security and the larger is inability to find the time to make a good job of it. Yet, with your country vitally concerned with national defense, there are many things I would like to pass on and still keep clear of the danger zone. For these plans for gas in time of war must be long-sighted—as we have learned by experience.

For the present let me just say that gas is carrying on despite some rough handling. Failures are few and temporary; and the speed with which extensive damage is made good has to be seen to be believed — yes; the work of repair starts under fire! Some districts are hard pressed to meet the growing industrial demand—others, evacuation areas, for example have to meet the conditions of a much reduced demand. But, through it all, life goes on much as usual; more so than anyone reading the hot news might think.

I heard this morning from a good friend who is managing director of a meter firm in Coventry and he tells me that for the fourth time his works have been either burned out partly or bombed out. But he has never ceased production and the latest shot caused no more comment to me than this: "As I told you before, Jerry is enabling us to replan our works. By the time he has finished and we have won we shall have a great show."

Going beyond that, it is pretty rough going for this country to face up—after the style of St. George and the Dragon—to the tough guys of Europe. However, that is getting political and I will just add that now that we have the sympathy and active support of your great country our confidence in the future of democracy, never lacking despite the trials, is abounding.

Now a word or two about "papers." The voluntary censorship works like clockwork. We never get into difficulties with it for the simple reason that we know the line and keep to it. So far as we are concerned there might be no censorship. In the early stages the matter was discussed amicably with that department and since then we have not heard from them. We know what they want and we try to keep to that line.

Paper itself is always a problem in time of war; but here again we are in no trouble. Newsprint is, obviously, a problem; but for our grades of paper we are able to get all we can reasonably expect—and you see the issues—without trouble.

Process engraving. We have no real difficulty. We have to keep the demand low; but blocks appear at the printers in due course.

We have no censorship on advertisements—except such as I am expected to exercise—and that is slight.

Contributors are a problem. With so many men called-up for military service and the staff that is left working double shifts, there is little time to write for the press.

Our London offices, which we retain, had the windows blown out in November and the top burned off in December—and I am told that we have a time bomb sitting on the doorstep as the result of last week's Blitz; but that is a mere incident and does not ruffle the calm of this office.

Well, there I must stop or I shall be writing a blurb. But in parting let me say that the *Gas Times* will be there and that we shall be in communion with our good friends *GAS* when this shindy is over and done with—and I trust, done with for all time.

With kindest regards and all good wishes for *GAS*,

Yours sincerely,
"The Gas Times,"
H. STANIFORTH,
Executive Director.

Still another picture of the significant role that the gas industry is playing in English domestic life under war conditions is described in another letter from Eileen Murphy, home service

director, British Commercial Gas Association, to Davis M. DeBard, of New York. Excerpts from this letter follow:

Davis M. DeBard, Esq., Vice President,
Stone & Webster Service Corp.,
90 Broad Street, New York.

Dear Mr. DeBard:

I shall be out of the office next week on a week's "rest period"; this is our war-time name for holiday, or what you call vacation! I thought I should send you a note before I leave in reply to your letter of the 26th June, in which you asked a great many questions in connection with A. R. P. in connection with gas works.

I may mention that a comprehensive scheme for mutual assistance in the event of air raid damage is in process of being evolved among Scottish Gas Undertakings. The scheme envisages assistance by the supply of personnel and material to any undertaking badly hit by enemy action, the damaged undertaking being required to pay at net prices the cost of any help provided. The Edinburgh Corporation Gas Department is one of the leading supporters of this plan.

Bombing has shown too that the mutual aid organization working in the Manchester district has been of immense assistance in repairing damage quickly and in speeding up the restriction of gas supplies. Mobile repair equipment and men have travelled distances of some 30 or 40 miles to render assistance in blitzed areas in the shortest possible time after attack, but arrangements are being made to provide a supply of skilled labour in the various works so that minimum calls will be made for outside assistance.

An excellent example has been set in Newcastle-upon-Tyne where, as a result of the initiative shown by the local gas undertaking co-ordination has been established between the managers and supervisors of industrial canteens in the district. At the first meeting held those attending represented canteens supplying daily some 6000 to 8000 meals for workers and 20,000 snack meals for troops. A useful discussion was held on the planning of menus in wartime and the meeting showed that this scheme of co-operation will have valuable results, not only from an educative aspect, but in assisting in the economical use of food supplies.

A feature of the public relations work between gas undertakings and their customers is the establishment on undertaking's premises of Food Advice Bureaus, in support of the National Food Campaign. These Bureaux, staffed by our demonstrators, are open during the hours most convenient to shoppers and women can obtain information on rationing and catering problems as well as on the best use of unusual foodstuffs, introduced as a result of the war. As an example of the latter, may be mentioned the supplies of salt codfish from Iceland; these were available at cheap prices but many housewives were ignorant of the way in which to prepare the fish for table until they had consulted the Food Advisor at their local Bureau.

The great interest shown by Local Authorities in dual purpose cooking equipment for British Restaurants, is stimulating the production of new ideas on similar lines. A new type of gas burner for the conversion of solid fuel cooking ranges which makes the change-over a speedy and simple operation is now on the market, and similar fittings are available for use with central heating and hot water plant. By these means central heating boilers and hot water boilers normally fired by gas can be easily converted to burn solid fuel in times of emergency when there may be a temporary interruption to the supply of gas.

Owing to the heavy demands of our war factories for coal, the Mines Department is about to organize a campaign to encourage economy in coal and manufactured fuels in all non-industrial premises. The Gas and Electric Industries will co-operate; this means that in future we have to concentrate on persuading our customers to use as little gas as possible. When we have prepared literature on the subject I will let you have some.

It is very kind of you to offer to send a box of onion skin paper with air mail envelopes. My Secretary and I have decided that we would like to accept this offer, because whilst I cannot see that I would ever be short of a little paper on which to write to you, we cannot be sure of getting the very thin paper for air mail letters. Also all your letters have arrived safely.

I hope you and Mrs. DeBard are well. How I long for a sight of New York!

Yours sincerely,
EILEEN MURPHY,
Home Service Director.
British Commercial Gas Association, London.

In its February, 1941, issue (page 15), *GAS* presented a series of excerpts from *The Gas Times* which gave an insight into the prevalent attitudes toward specific war-time conditions and described in some detail a few of the operating methods used to counter-attack the blitz. A second series of such excerpts is published herewith.

Excerpts from "The Gas Times"

The Gas Was All Right

EARLY one morning, after a further piece of Nazi infamy, a woman sorted me out from among dozens of rescue workers, wardens, ambulance people, and the rest. She had been advised to leave her home for the night. Returning in the morning she buttonholed me and asked whether it was all right for her to go into her home to make some tea. I told her that I was not the competent authority to give her such advice, but said that from the look of the place I should think it was safe enough.

I offered to go in with her. In we went, and on went the kettle. "Thank goodness the gas is all right," she said.

Amid all the desolation of her home, with windows broken, doors broken, ceilings down, and furniture smashed, this poor old lady had one cause for thankfulness. Her grief had a little less chance of utterance, because the *gas* was all right.

Gas Explosions

APPARENTLY nothing will eradicate from the mind of the newspaper man the idea that gas is explosive. No; not even in wartime when real explosions are a commonplace. I notice, for instance, that the caption to a picture in the *Daily Telegraph* is "Flames from a Gas Explosion in a London Street," when what is pictured is the havoc wrought by an enemy bomb, with a broken gas main supplying a feeble flame—probably welcomed by the firemen shown playing on nearby buildings! It may not look important to many folk—including some gas men, who, because they know, think that everybody should know—but once again I would suggest that somebody should set to work to give newspaper men ocular proof that gas, *per se*, is not explosive.

Knock a hole in a holder and let some not too heroic gas engineer light up the leak and so demonstrate to the journalists what really does happen. Not a good holder — some old crock would serve. And then ignite a "broken" main as they have been ignited in plenty in recent times for demonstration purposes. Very well; if we must be fussy, ignite the gas issuing from the broken main; but we cannot always stop to convert statements which everybody understands into terms which nobody can fathom. Many people who live near gasworks should have been reassured in no uncertain manner that they were not running any greater risks than others living far from gasholders.

Gas Appliances Are Bought

ONE result of the war—a remarkable result and eloquent testimony to our confidence in ultimate victory —is that Lancastrians are buying new gas appliances.

In the past few weeks gas showrooms in towns as scattered as Preston, Blackpool, St. Annes, Darwen, Chorley, Blackburn, Burnley, and a whole list far too long to accommodate here in these days of restricted space, have had very good business.

Only in a very few cases do gas showroom managers in the North-west complain about their takings. The most frequent reply to inquiries is that business is entirely satisfactory. Big money is being earned up in Lancashire and people who have wanted new gas cookers, heaters, gas fires, etc., but could not afford to buy them are flocking to the showrooms and choosing to their heart's content.

Combustible Gas Mixture in Pipe Lines

Their Prevention by Use of a "Slug" of Inert Gas to Separate Natural Gas and Air in Purging Operations

By ELTING HENDERSON

General Superintendent of Distribution, Southern California Gas Company, Los Angeles, California

INTRODUCTION

EXPLOSIONS in pipe lines containing mixtures of hydrocarbon vapors and air of sufficient violence to rupture and in some cases to lift the line from beneath the ground, have been known to occur. The violence of such explosions is surprising since, from theoretical calculations, assuming the mixture to be ignited in a small vessel, only comparatively low pressures of 100 or 200 lbs. per sq. in. would be developed. A review of the literature reveals that these theoretical expectations have been sustained in the cases of experiments with natural gas-air mixtures in small vessels, but in some instances when working with small tubes or short lengths of pipe there is an indication that more violent explosions could be expected under certain conditions where the pressure waves could reinforce each other or the burning proceed more rapidly than the normal rate of flame propagation.

In order to gain more information on this general subject, learn the conditions under which the pipe-rupturing pressures may develop, and explore the need for precautionary measures during such operations as purging pipe lines in and out of service, a series of experiments have recently been conducted by the Southern California Gas Co. These experiments were made on sections of 4-in. welded pipe with lengths from 300 to 3000 ft., and included a study of such variables as: length of pipe; point of ignition; composition, velocity, and initial pressure and temperature of gas-air mixture; restrictions in pipe; open and/or closed ends on pipe.

Within the limits of this series of tests it was found that: the composition of the gas-air mixture is not critical, substantially equal pressures being developed as the gas content varies 2% or 3% either way from the theoretically "ideal" value; after the initial pressure peak is reached the length of pipe does not materially affect the intensity of the developed pressure, but obstructions in a pipe tend to develop pressure peaks; as the initial pressure increases, or the initial temperature decreases, the pressures following ignition become greater; under conditions of movement of the combustible mixture in the pipe, the pressures following ignition are materially greater in turbulent flow than in streamline flow; at atmospheric pressure, with the combustible mixture in a static condition, the pressures developed were of the order of magnitude of 100 or 200 lbs. per sq. in. (as calculated); with the combustible mixture in turbulent flow and at essentially atmospheric pressure, ignition caused development of a pressure of approximately 2000 lbs. per sq. in. at a point 50 ft. distant, and the pressure wave continued along the line at an intensity of about 500 lbs. per sq. in.; with the combustible mixture ignited in turbulent flow and at 90 lbs. per sq. in., a length of the 4-in. line split wide open for a distance of 7 ft., another length was noticeably bulged, a peak pressure of approximately 9000 lbs. per sq. in. was measured, and a pressure wave continued down the line at an intensity of about 3000 lbs. per sq. in.

These experiments verified the desirability, in pipe line engineering, of avoiding combustible gas mixtures at all times, and a second study was made to investigate and develop a procedure for purging gas lines in and out of service, involving the introduction and maintenance of a gas barrier or "slug" of inert gas between the natural gas and air during their movement through the pipe line. The remainder of this article is concerned with the prevention of combustible mixtures in pipe lines.

ELTING HENDERSON

ELTING HENDERSON started in the gas business as a cook in a construction camp for the Kansas Natural Gas Co. in 1907, and remained with that company in various capacities until 1914, when he moved to Taft, Calif., as plant engineer for the Midway Gas Co. His affiliation with the Southern California Gas Co. began some 10 years later when Midway was merged with the Los Angeles utility. With the Southern California Gas Co. he has served as plant superintendent, division superintendent, assistant general superintendent of production and transmission, assistant general superintendent of distribution, and in October, 1940, became general superintendent of distribution. The paper which is herewith presented with minor deletions is Part II of a study entitled "Combustible Gas Mixtures in Pipe Lines: Part I—Effects of Ignition; Part II—Means of Prevention." This paper is to be presented before the 48th Annual Convention of the Pacific Coast Gas Association at Del Monte, Calif., September 10-12, 1941.—Editor.

DISPLACEMENT of natural gas or air from gas-containing structures is a necessary operation of the gas industry. In the absence of special precautions explosive mixtures may be formed during some phase of the operation.

This report consists of two parts. The first is a study of the factors involved in the formation of a moving barrier or "slug" of inert gas between the air and natural gas, as a safety measure, during the purging of gas mains. The second part contains recommendations for a specific procedure for the use of a slug of inert gas in purging mains.

I. EXPERIMENTAL DATA

A PRELIMINARY study indicated that factors which would influence the amount of inert gas required would include velocity of purge gas; length of pipe; size of pipe; kind of inert gas used as slug; temperature; pressure; roughness; bends, restrictions, or other irregularities in pipe; and method of injecting gas used as slug.

Instruments for Measuring Mixing

Recording Gravitometers: An attempt was made to use recording gravitometers to determine the amount of mixing of two gases, but they were slow to respond to a change in concentration of the gases. Also, one type was found to be affected by air currents about the instrument and could not be used in the field. Since these instru-

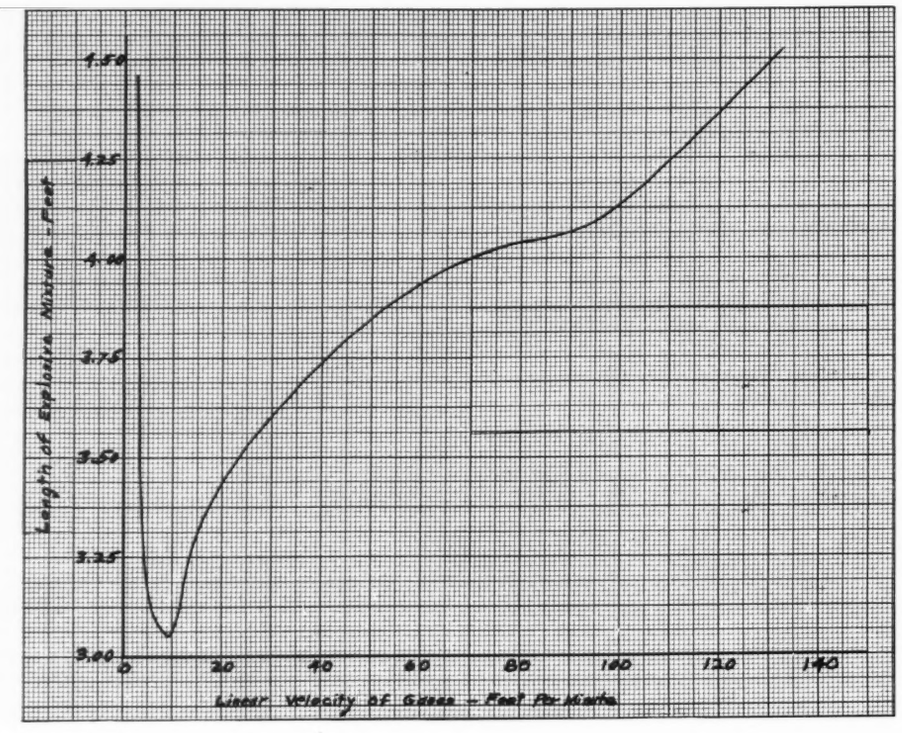


FIG. 1. Length of explosive mixture versus velocity, measured in 10 ft. of 2-in. pipe and glass tubing.

ments do not indicate a concentration change involving gases of equal or nearly-equal density, they could not be used to determine the composition of nitrogen-air mixtures.

Combustible Gas Indicators: The combustible gas indicator was next investigated and found to be a satisfactory instrument for the determination of the degree of mixing of natural gas and air. This type of instrument operates by the combustion of the gas sample on a hot filament in a Wheatstone bridge circuit, and indicates the percent explosibility of the mixture. For natural gas, 100% explosibility corresponds to 4.75% gas in air. The instruments used were calibrated on natural gas-air mixtures.

The use of these instruments when only natural gas and air mixtures are involved can be readily visualized; and it was disclosed that even when an inert gas was introduced, such as when using a slug of nitrogen between the natural gas and the air, the instrument would still read correctly up to a concentration of 90% inerts in the gas-air sample passing through it. In other words, even when 90% inerts were present, there was sufficient oxygen in the sample to completely burn the natural gas content of the sample at 4.75% concentration.

Therefore the combustible gas indicator could be used to disclose the degree of mixing of natural gas and air even when this mixing had taken place through a slug of inert gas.

Laboratory Tests

Equipment and Procedure: Tests undertaken in a 10-ft. length of 2-in. glass tubing were made primarily to learn as much as possible about the mechanics of mixing of two gases as one is purged by the other from the line. Smoke-laden air was used to purge gas from the tube while observations of the gas-air interface were made. This method of observation is limited to glass tubing and to low velocities at which the interface between the gases does not move too rapidly to inspect.

Further tests were made in a 10-ft. section of 2-in. iron pipe. Combustible gas indicators were chosen during these experiments to indicate mixing. The laboratory tests were at velocities in the region of streamline flow of the gases (from a velocity of 2 to 135 ft. per minute).

Laboratory Results: Stratification could be observed at the low velocities when smoke was used. The same stratification could be detected when using the combustible gas indicator by noting the difference in the time of arrival of air at the top and at the bottom of the tube. Such stratification or flow of the air under the gas is due to the density difference between the two gases.

Tests were made to determine the effect of purge velocity, below the turbulent range, on the length of the air-gas mixture. The results of these tests are shown in Fig. 1 and indicate for 10-ft. of 2-in. pipe that the least amount of mixing is at a linear velocity of the gases of 9.7 ft. per minute. At velocities of less than 2 ft. per minute, no slug at all is formed as the air continuously flows under the gas and the gas is only very slowly removed.

Yard Tests

Equipment and Procedure: In order that tests at higher velocities and with larger and longer pipe might be carried out, test equipment shown in Fig. 2 was made at the company's 48th Street yard. It was constructed from 330 ft. of 6-in. junk pipe. Test holes were drilled in the pipe at 10-ft. intervals to permit testing of the contents with a combustible gas indicator.

In most of these tests, the pipe was filled with gas; and air was used to purge it from the line. The elapsed time from the start of the purge at a known velocity until pure air was indicated at each length of pipe was observed. From the difference between the observed time to pure air and the time which would have elapsed had there been no mixing, the amount of air actually mixed with gas was calculated. Velocities from 9.7 to 300 ft. per minute were tested. For subsequent tests in which nitrogen was to be used as a slug between natural gas and air, this amount of air was to be used to estimate the volume of nitrogen required. In these tests the pipe was first filled with gas and the estimated quantity of nitrogen was injected, followed immediately by the air flow. As the slug of nitrogen passed down the pipe, it was tested at each tap for explosibility to determine over what length of pipe it was effective in preventing the formation of an explosive mixture.

Yard Test Results

Effect of Velocity on Mixing: The stratification or flowing of the air under the gas was observed at low velocities. However, above approximately 150 ft. per minute no stratification was observed. At the low velocities, when the heavier gas (air) was purging the lighter gas (natural gas), the former arrived at the bottom of the pipe first, indicating that the purge gas front was in the shape of a wedge with the tip of the wedge at the bottom of the pipe. If the pipe is full of air which is being purged by gas, the reverse effect is noted. That is, the purging gas appears at the top of the pipe first, advancing with a wedge-shaped front with the tip of the wedge at the top of the pipe.

It was also observed that the highest velocities tested caused the least amount of mixing; that is, the length of the zone of mixed gases was the least. The amount of mixing at low velocities was high and is not presented here. The

data taken in velocities of 81 ft. per minute and higher are presented in Fig. 3. The dotted lines show the calculated time for the arrival of the interface had there been no mixing. From the difference in the ordinate (time) of the calculated and experimental arrival of pure air, the amount of air actually mixed with gas was calculated. The results of these calculations are given in Fig. 4 and show the effect of length of pipe and velocity on the amount of mixing.

Effect of Length of Pipe: It may be noted from Fig. 3 that, except for a high rate of initial mixing, the additional mixing is directly proportional to the length of pipe. This initial mixing, which is noted at all velocities of purging tested, may explain why, for the tests in the 10-ft.-long tubes in the laboratory, the velocity found to give the least mixing was so different from that found in the yard tests in longer pipe. The laboratory measurements may have been entirely in this initial mixing zone so that the results were not applicable to longer lengths of pipe.

Use of Nitrogen as a Slug: In the limited number of tests at this location using nitrogen as a slug, the volume of nitrogen necessary to prevent the formation of an explosive mixture for a given length of pipe was found to be about equal to the amount of air shown in Fig. 4 at the corresponding velocity.

It was not possible to measure accurately the volume of inert gas or the effect of the length of pipe at high velocity without changing the metering equipment and lengthening the line considerably. Such changes were not considered necessary since these effects could be later tested in a long length of 8-in. main which was available.

Other Variables Studied: Some other variables which might have influenced the amount of mixing were also studied and are as follows:

1. Temperature — The temperature on duplicate runs varied from 83° to 106° F. without altering results.

2. Bends in the pipe — Two 90° elbows placed in the pipe made no difference which could be detected. Therefore, it appears that open valves or bends in a main will not affect the mixing.

3. Method of injection — The gases were injected into the main in two different directions; first, with a flow parallel to that in the pipe and then, with a flow perpendicular to that in the pipe. There was no noticeable effect on the mixing.

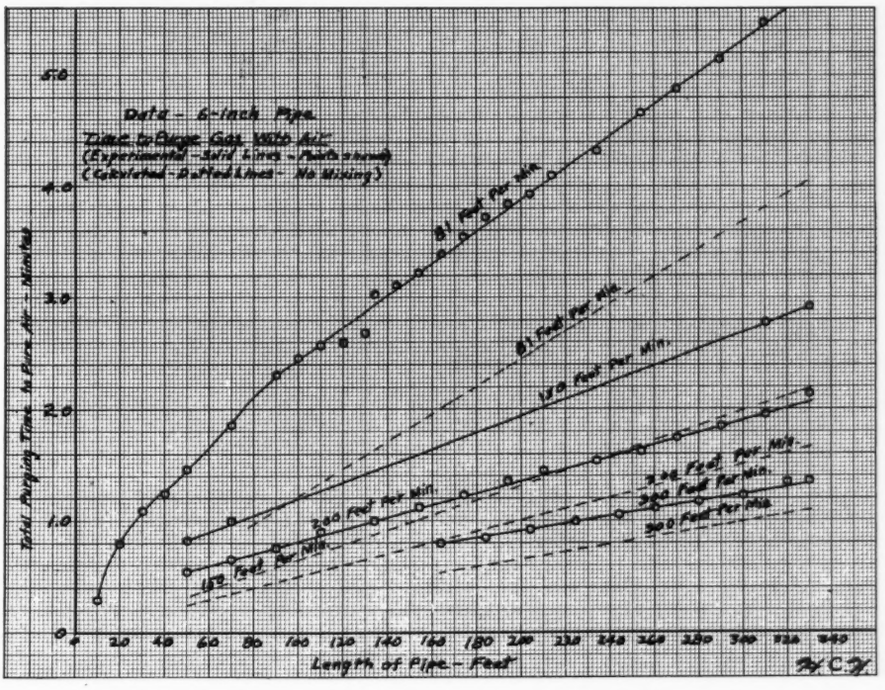

Data - 6-inch Pipe.
Time to Purge Gas Into Air
(Experimental - Solid Lines - Plain Pipe)
(Calculated - Dotted Lines - No Mixing)
Total Purging Time, in Hours per 1000 Feet
Length of Pipe - Feet
81 Feet per Min.
81 Feet per Min.
132 Feet per Min.
200 Feet per Min.
246 Feet per Min.
300 Feet per Min.
300 Feet per Min.
By C.Y.

FIG. 3. Data taken at velocities of 81 ft. per minute or higher on 6-in. pipe.

Field Tests

Equipment and Procedure: Extension of the data obtained on the 6-in. length of pipe was made by tests conducted on 10,850 ft. of abandoned 8-in. main. The equipment used at the upstream end of the test main to control and measure the flow of gases is shown in Fig. 5. An orifice meter was used to measure the air, gas, and inert gas during the first series of runs when the linear velocities of the gases were from 100 to 500 ft. per minute. Air was furnished by an air compressor, and natural gas, under about 45 lbs. pressure, was available from a main at this location. Test taps were located at about 2500-ft. intervals along the main. Fig. 6 shows a test tap with a combustible gas indicator in place for a test.

In the first runs at this location, the volume of air mixed with gas during displacement of gas with air was determined for several lengths of pipe and different velocities. It was found that, over the length of pipe and the range of velocities investigated, the volume of air mixed with gas was small and did not vary as much with the length of the pipe as expected.

It was not possible to use the amount of air in the air-gas mixture as a measure of the amount of nitrogen required as an inert slug because:

1. Small volumes and volume changes of the air in the air-gas mixture could not be accurately calculated.

2. The relation that the amount of nitrogen required would be equal to

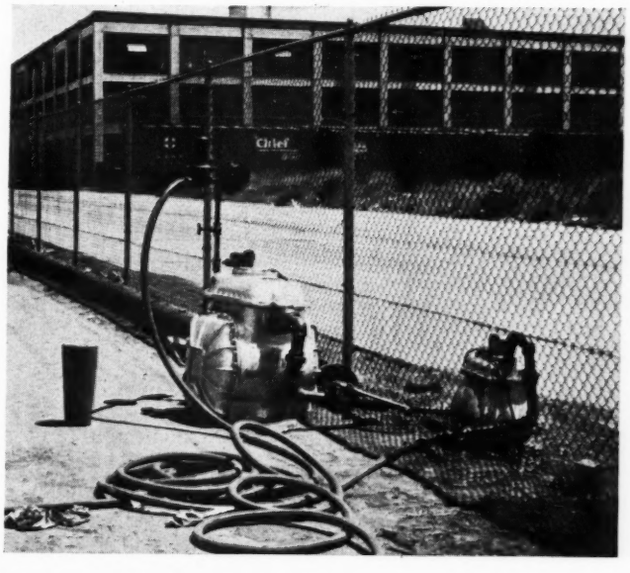


FIG. 2. Equipment made in the company's yards for tests at higher velocities and with larger and longer pipe.

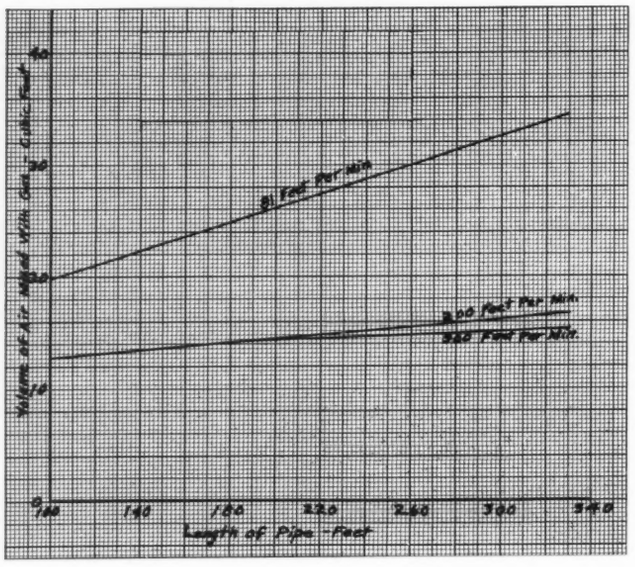


FIG. 4.
Volume of air mixed with gas, 6-in. pipe.

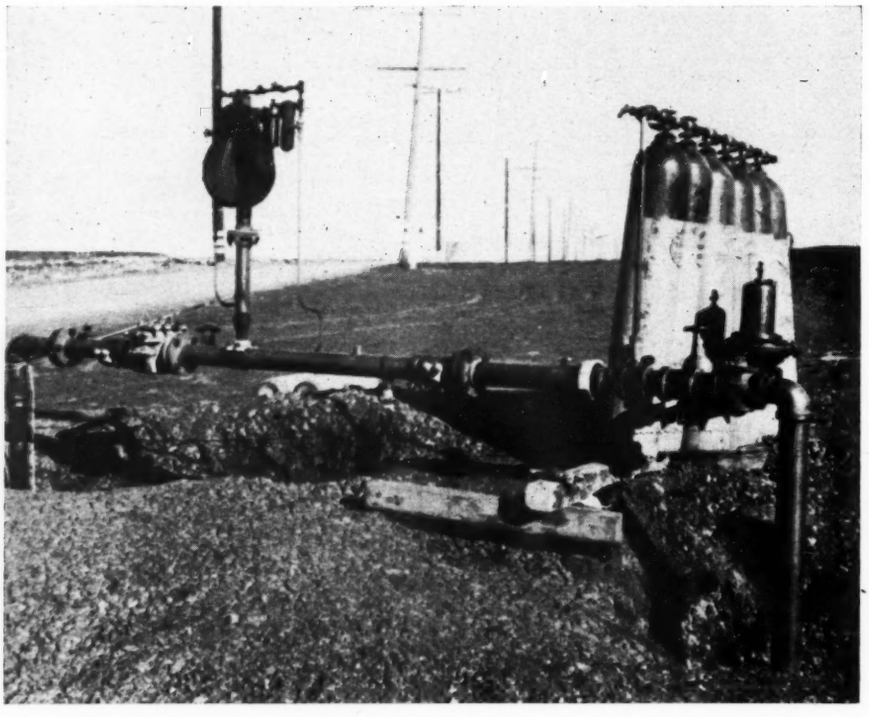


FIG. 5. Equipment used at upstream end of test main to control and measure flow of gases.

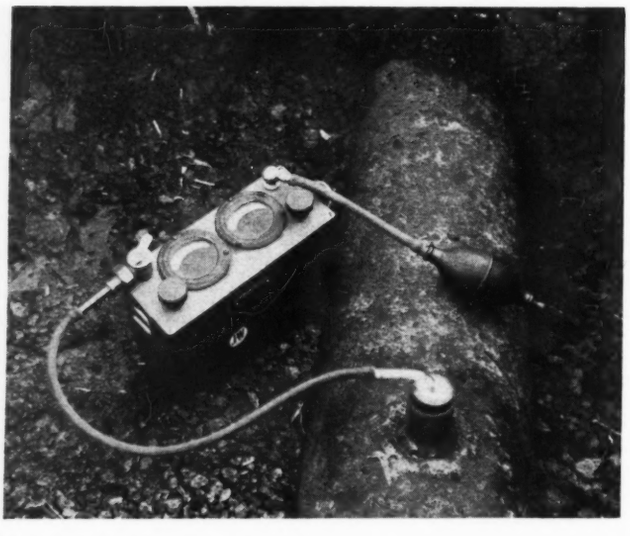


FIG. 6.
A test tap with a combustible gas indicator in place for a test.

the amount of air in the air-gas mixture is only approximate.

The procedure for making the nitrogen runs was carried out as follows: The main was purged of gas with a given amount of nitrogen (followed by air) estimated to be too small to purge the entire main without forming an explosive mixture. During the purging, combustible gas indicator readings were taken at each tap. This procedure was repeated, using several widely different amounts of nitrogen, until several different combustible indicator readings were obtained at each tap. By drawing a curve from the plot of the volume of nitrogen and the indicator readings for each length of pipe, it was possible to pick from the curves the amount of nitrogen for a given length of pipe, which would just give an explosive reading of 4.7. Such a curve is shown in Fig. 7. The above method was also used for natural gas purging air.

Two other gases were also tested for use as an inert slug. They were carbon dioxide from cylinders and exhaust gas from the gasoline engine of an air compressor.

A further expansion of the data was made to include high velocities of purging such as are encountered during the blowing of a main. Because of the high rates of flow a large displacement meter was installed to measure the inert gas so that this measurement might still be made accurately. Velocities of the purge gases from 2900 to 3300 ft. per minute were tested. Gas purging air from the main with nitrogen as the slug was the only type of purge tested at these high velocities.

Due to the high velocity, the combustible gas indicator readings could be made only by slowing the gas flow down as the slug approached the test tap. For this reason only the quantity of inert gas for purging 10,850 ft. was determined.

Results of Field Tests

Effect of Pipe Length: In Fig. 8 is shown the effect of pipe length on the length of nitrogen slug required. The results are rather striking from the standpoint of the amount of nitrogen required. At the higher velocities of purging, for example, at 500 linear ft. per minute, 23.5 cu. ft. of nitrogen forming a slug 70 ft. long in 8-in. pipe will prevent the formation of an explosive mixture in 1000 ft. of pipe. Also only 54 cu. ft. of nitrogen forming a slug 155 ft. long will, at the same velocity, prevent formation of explosive mixture in 10,000 ft. of 8-in. pipe.

Effect of Velocity of Purge: Fig. 9 is an illustration of the effect of velocity on the length of slug required to

prevent the formation of an explosive mixture. This shows plainly the rapid increase in nitrogen requirements for velocities of purge gas below 200 ft. per minute.

Gas Purging Air: All of the above results of the tests in the 8-in. main are from the data taken when air was purging from the main with nitrogen as the inert slug between the gas and air. With the reverse procedure, all of the above volume requirements tested were found to be the same. Therefore, the same amount of inert gas as a slug may be used if either gas or air is being purged from a main.

The following paragraphs consider cases where gases other than nitrogen were used for the inert slug.

1. *Carbon Dioxide:* In comparing the results of the tests using carbon dioxide as the inert slug with those using nitrogen, the carbon dioxide was found to be equally effective in preventing the formation of an explosive mixture for all velocities of approximately 300 ft. per minute and higher. At a velocity of 100 ft. per minute (the lowest velocity tested in the 8-in. main), the amount of carbon dioxide, based on the results obtained with nitrogen, fell far short of accomplishing a safe purge. Table 1 is a comparison of data obtained with nitrogen and carbon dioxide.

The cost per unit volume of carbon dioxide is 75% of that of nitrogen in this city. However, the cost of the inert gas will be small in any case unless the main is very long and/or large. A factor in favor of carbon dioxide for an inert slug is its availability in most localities.

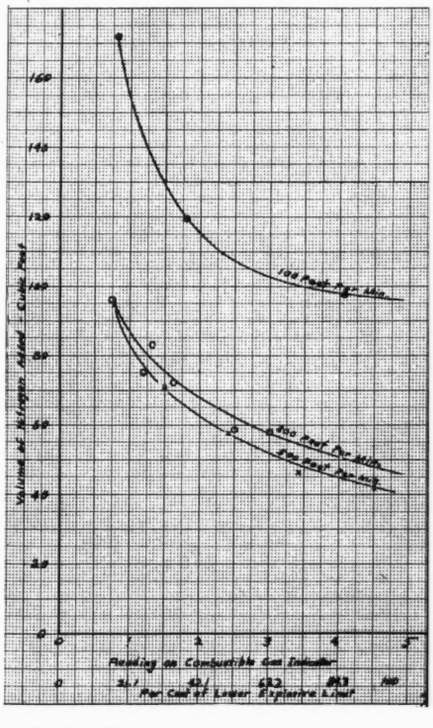


FIG. 7. Effect of nitrogen volume on explosibility (for 5000 ft. of 8-in. main).

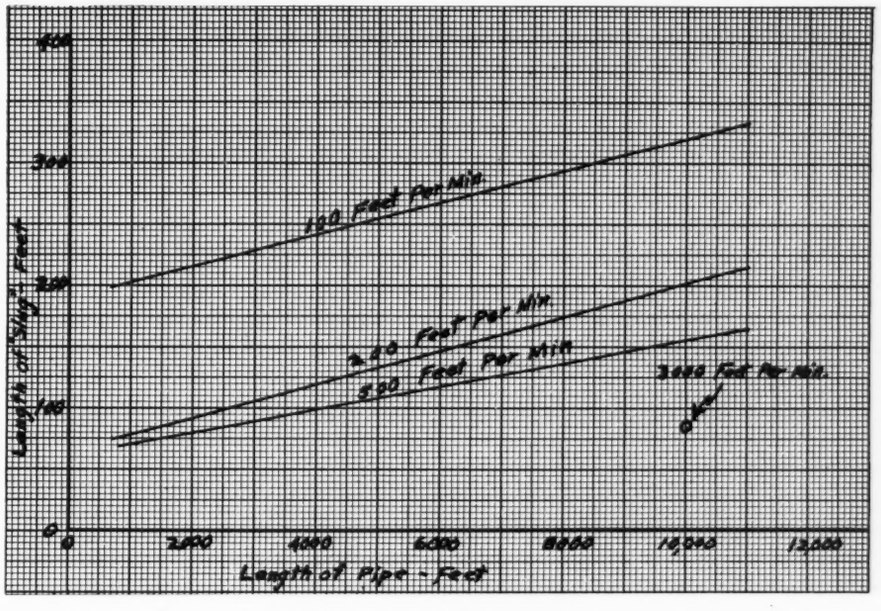


FIG. 8. Effect of pipe length on length of nitrogen "slug" required to prevent an explosive mixture in an 8-in. main.

2. *Exhaust Gas:* Exhaust gas from a gasoline engine is effective in preventing the formation of an explosive mixture at the same velocities for which nitrogen is effective. However, the exhaust gas contains a small amount of oxygen and combustible gas so that about 120% of the amount of nitrogen is required (Table 2). This is not a serious objection since, by virtue of its source, it is available in large quantities.

A difficulty attending the use of exhaust gas is the inconvenience of making connections for its use. Pipe connections must be made from the engine for the introduction of the gas into the main since rubber hose is impractical because of the high temperature of the exhaust gas. This difficulty may be overcome by securing flexible metal tubing to handle the hot gas.

Stability of Conditions After Purging: A test was conducted to check the retention of gas by pitted pipe walls, pipe fittings, drips, and granular or porous corrosion products to determine the completeness or stability of a purge when a considerable time elapses between purging a main and welding it. The 8-in. main was allowed to stand four days filled with gas to allow time for absorption of the gas. It was then purged, and tested with a leak indicator to detect any liberation of natural gas. None could be detected from checks made occasionally over a period of 48 hours.

General Discussion

In order to better understand the way that mixing of gases occurs in a pipe and so causes a slug of inert gas to be dissipated, the following discussion of the factors which influence the retention of the slug are given:

1. *Stratification Due to Density Difference of the Gases:* This effect is very greatly decreased at higher gas velocities. A large decrease in the amount of mixing is noted when a velocity sufficient to eliminate noticeable stratification is reached. The forces due to density difference, tending to cause stratification, are, in the case of horizontal pipe, proportional to the diameter of the pipe. This fact may result in greater difficulty in maintaining a slug in pipe of large diameter.

2. *Turbulence:* Turbulence of the gases, as determined by fluid flow calculations, begins when velocities are reached which are somewhat below those which were found to practically eliminate stratification. It, therefore,

TABLE 1. COMPARISON OF CARBON DIOXIDE AND NITROGEN DATA
(8-in. Main)

Velocity (Ft./Min.)	*Inert Gas Volume (Cubic Feet)*		*Combustible Gas Indicator Readings* At 490 ft.	At 2792 ft.	At 7232 ft.	At 10,825 ft.
100	Nitrogen	105	0.4			
	Carbon Dioxide	105	4.7			
100	Nitrogen	75	2.4			
	Carbon Dioxide	70	Explosive 27 sec.			
300	Nitrogen	59	0.7	1.2	4.0	
	Carbon Dioxide	65	0.3	1.4	4.0	
300	Nitrogen	36	1.2	4.4		
	Carbon Dioxide	35	1.1	Explosive 2 sec.		
500	Nitrogen	58	0.5	1.5	3.4	4.7
	Carbon Dioxide	62	0.2	1.2	3.1	4.7
500	Nitrogen	95	0.3	0.5	1.2	1.7
	Carbon Dioxide	91	0.2	0.25	0.5	0.8

TABLE 2. COMPARISON OF EXHAUST GAS AND NITROGEN DATA
(8-in. Main)

Velocity (Ft./Min.)		*Volume Cu. Ft.*	*Combustible Gas Indicator Readings* At 490 ft.	At 2792 ft.	At 7232 ft.	At 10.825 ft.
100	Nitrogen	116	0.2	0.25		
	Exhaust Gas	116	2.2	4.5		
300	Nitrogen	96	0.4	0.5	1.2	2.3
	Exhaust Gas	95	1.5	1.8	2.6	3.7
300	Nitrogen	83	0.5	0.7	2.2	3.6
	Exhaust Gas	84	1.8	2.0	2.6	4.7

TABLE 3. LENGTH OF INERT SLUG REQUIRED FOR PIPES OF 8 IN. DIAMETER AND LESS*

Pipe Length	*Length of Slug*		
	Purging Velocity 100-200 Ft./Min.	*Purging Velocity 200-500 Ft./Min.*	*Purging Velocity Over 500 Ft./Min.*
Feet	*Length, Ft.*	*Length, Ft.*	*Length, Ft.*
1000 or less	203	78	72
1000 - 2000	217	91	81
2000 - 4000	245	120	101
4000 - 6000	273	146	118
6000 - 8000	300	174	138
8000 - 10,000	328	202	156

*For pipes larger than 8 in., see text under Operating Recommendations.

appears that turbulence is the factor which decreases the stratification. Since the amount of mixing and the volume of inert gas required as a slug are decreased markedly as the stratification decreases, it becomes evident that turbulence, even if in itself causing some mixing, is much less the cause of deterioration of the slug than is stratification.

3. *Effect of Delay During Purge:* A delay of not more than three minutes between the addition of the inert gas and the purge with air or gas was found to have destroyed the slug. In order to see how this might occur, a laboratory test was performed as follows: Two 4-ft. lengths of ½-in. glass tubing were connected in the center by a stopcock and placed in a horizontal position. The stopcock was closed and one end filled with a dilute caustic solution. The other end was filled with methanol containing phenolphthalein. The solutions, which are colorless, would turn red on mixing.

The density ratio of methanol and water is only slightly different from that of gas and air, and the two solutions will mix in any proportion, therefore, their behavior would likely be similar to air and gas in a pipe.

When the stopcock was opened and the tubing kept stationary, there was rapid mixing by stratification at first with the rate of travel gradually slowing down. In 5½ minutes the mixing had occurred for 30 in. each direction from the stopcock. In tests when the stopcock was opened and the tube then rotated about its axis to prevent stratification, there was still rapid mixing at first but its rate of mixing slowed down much more rapidly, and the solutions did not mix beyond 12 in. each way from the stopcock except over a very long period of time.

The first case, when the tube was not rotated, is analogous to the situation in purging when there is no turbulence as in the case of a delay after the addition of the inert gas or in purging at very low velocities. The second case, when the tube was rotated and turbulence produced by this means, is analogous to purging at a velocity high enough to produce turbulence. This shows that turbulence is effective in diminishing stratification and thus prevents the slug from deteriorating rapidly.

There are two ways by which turbulence may reduce stratification. One is that the currents in every direction in the gases under such conditions tend to break up any flow of one gas under or over the other gas. This leads to the other effect of turbulence which is that a gradient mixture is produced, a mixture having one pure gas at one end and a gradual change to another pure gas at the other. With turbulence there is no difference in composition from top to bottom of the pipe at any point. Such a gradient mixture formed over a sufficient length of pipe apparently slows down further mixing.

4. *Effect of Pressure:* A pressure of 10 in. of water was maintained in the 6-in. pipe by restricting the flow at the outlet to test the effect of pressure. No difference could be detected in the amount of air which mixed with gas as compared with tests made at atmospheric pressure. In tests in the 8-in. main made at velocities of 3300 ft. per minute, a pressure on the slug as high as 19 lbs. per sq. in. gage was observed. This pressure was caused by the friction in the pipe and stack.

At this pressure, it could be calculated that more than twice as much inert gas would be required to form a slug of given length than at atmospheric pressure. However, as may be noted in Fig. 9, the length of slug required at a velocity of 3300 ft. per minute is about one-half the length required at 500 ft. per minute. The net result is that about the same amount of inert gas must be used in either case. The decrease in the length of slug at high velocities could be due to (1) the shorter time involved, (2) increase in turbulence, (3) and perhaps the pressure itself which may have some effect on the rate of mixing by changing viscosity and density.

II. OPERATING RECOMMENDATIONS

THE length and size of pipe and the velocity of purge which will exist in a particular situation should first be taken into account. When exhaust gas or nitrogen is to be used for the inert slug, the velocity of the purge gases

must not be below 100 ft. per minute and preferably be 200 ft. per minute or higher. The velocity should not be allowed to fall below 300 ft. per minute when carbon dioxide is the inert gas used. Velocities up to 3300 ft. per minute were tested and found to be satisfactory. There is no reason to believe that higher velocities would not also be satisfactory. Pressure in the line being purged, due to restrictions and friction, may occur at high velocities and must be considered in determining the volume of inert gas to form a slug of necessary length.

When the length of pipe and velocity of purge are known, the length of slug necessary to just prevent the formation of an explosive mixture may be determined from the appropriate part of Table 3 for pipe sizes up to 8 in.

Determinations of the length of inert slug have not been made in pipes of larger than 8-in. diameter. Since the forces tending to cause stratification are proportional to the diameter of the pipe, it is possible that larger pipe will require a greater length of slug to prevent the formation of an explosive mixture. Until further tests are made in larger pipe, an arbitrary correction factor is suggested for use in determining length of slug. This is that the length of slug as read from the table be multiplied by the ratio of the diameter of the pipe to be purged to the 8-in. diameter from which the tables were made. This should be done in addition to the safety factor which is to be used. The volume of inert gas to be used is equal to the volume of the pipe of total length of slug as calculated above.

Equipment: Cylinders of inert gas of different sizes may be secured. Large size nitrogen cylinders contain 200 cu. ft. of gas and the same size carbon dioxide cylinders contain 440 cu. ft. of gas, so the number of cylinders of a particular gas may easily be determined, and a manifold constructed accordingly.

Any internal combustion engine of sufficient capacity may be used as a source of exhaust gas. The carburetion of the engine should be adjusted to give the minimum amount of oxygen and combustible gas in the exhaust gas. The oxygen in the gas may be determined with an Orsat type of apparatus and the combustible gas by means of a combustible gas indicator set for air dilution.

In making connections from the exhaust manifold to the pipe, any type of coupling not affected by the heat may be used; it is recommended, for its convenience, that a flexible metal tube be used.

Procedure: The manifold, with tanks assembled, is connected into the main near a valve at the upstream end of the section to be purged. The inert gas is introduced into the main at as rapid a rate as possible. The volume of nitrogen may be measured quite accurately by the pressure drop in the cylinders, but carbon dioxide cannot be so measured, and the volume must be determined by using the proper number of cylinders of proper size. The volume of exhaust gas is calculated from the capacity of the engine and time of gas injection. The inert gas is immediately followed by the air or natural gas with which the line is to be filled.

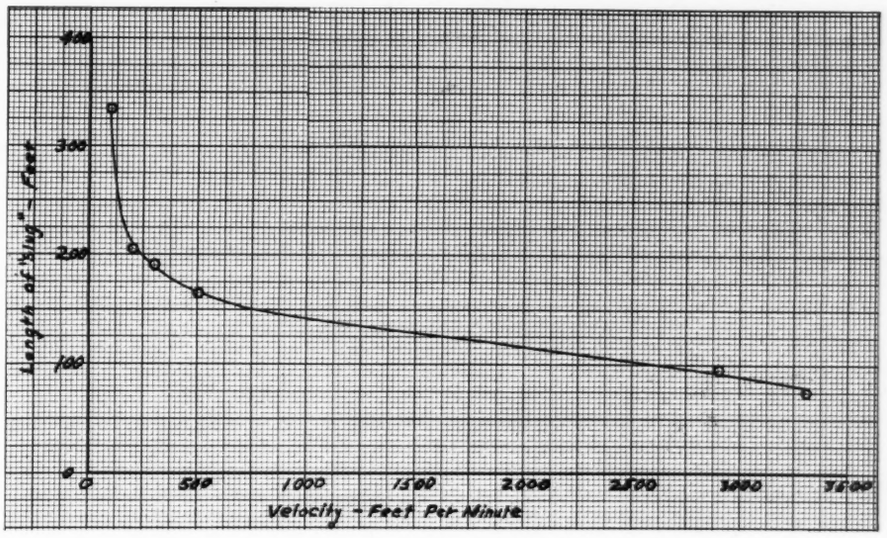


FIG. 9. Effect of velocity on length of "slug" required to prevent an explosive mixture (for 10,000 ft. of 8-in. main).

A summary of operating recommendations are as follows:

1. Determine: (a) Length of pipe and approximate velocity of purge obtainable; (b) Length of slug from tables.

2. Calculate: (a) Volume of inert gas for slug; (b) Multiply volume by safety factor; (c) Number of cylinders to give corrected volume.

3. Procedure: (a) Add required volume at a rapid rate; (b) Follow immediately with air or natural gas to complete the purge.

United Gas To Build 200-Mile Line

UNITED Gas Pipe Line Co. has announced the construction of a 200-mi. natural gas pipe line to supply the increasing fuel requirements of industries and cities in Louisiana and along the Gulf Coast of Mississippi and Alabama to Pensacola, Fla.

The new line will run from the gas fields of southern Louisiana across Lake Pontchartrain to Mandeville, La., eastward to Gulfport, Miss., and thence to Mobile, Ala. At Mandeville another line is being laid to Covington, La. It has been estimated that 56% of the line's capacity of approximately 80 M c.f. daily will be used by industries engaged in filling national defense contracts.

The crossing of Lake Pontchartrain will be the longest underwater natural gas pipe line in the world. A single line, 14 in. in diameter, will traverse the 25 miles of water from the southwestern bank to Mandeville on the northern shore. Construction on this section of the pipe line which will serve the southern cities began during the latter part of August.

The new line will tie-in to existing lines at several points, and at Mobile will connect with the Pensacola lateral line constructed several years ago, but built large enough to handle sufficient gas for all the requirements of the growing Pensacola industries and the U. S. Naval Training Station near that city.

United Gas Pipe Line Co.'s main transmission lines will, upon completion of the new project, encircle a large portion of the Gulf South. This part of the United System extends from the fields in lower Louisiana northward to Shreveport, La., and across to Monroe, La., and Jackson, Miss., southward to Mobile and Pensacola. The new line completes the loop by linking Mobile and intervening points with the Terrebonne parish gas wells, running from west to east.

Installing an 18-in. pipe crossing, Huspuckana River, near Clarksdale, Miss.

Memphis Natural Loops Delta Line

FIFTY-FIVE miles of 18-in. pipe line, parallel to the present carrying system, are being laid in the Mississippi delta region of the Memphis (Tenn.) Natural Gas Co. this summer to insure a steady flow of gas to a rapidly growing industrial Mid-South and to give many thousands of home owners and small industrialists insurance that they will receive sufficient gas during the 30 days each winter when the demand for heat reaches its peak, according to an announcement by Birger L. Johnson, company president.

The construction project will be completed about October 1 when the heating season begins. The laying of the new pipe line will duplicate all but a few miles of the 211 pipe miles from the fields near Guthrie, La., to the Brooks Avenue pumping station in Memphis where the Memphis Light, Gas & Water Division receives and retails the gas.

After completion of the 1941 program, only 43 of the company's 211 miles of pipe from the Monroe fields in Louisiana to Memphis will have single pipe connection. In addition to the pipe line project, the company is installing this year a new 600-hp. compressor at Guthrie, La. Total cost of the project is $800,000.

In 1940 the construction of 92 miles of line increased the system's capacity by approximately 18,000,000 cu. ft. of gas per day (*GAS*, Jan., 1941, p. 32), officials said. The program this year is expected to add another 10,000,000 cu. ft. to the total. The present operating capacity is 105,000,000 cu. ft. per day. The maximum capacity when this year's construction program is completed will be 115,000,000 cu. ft. per day. Last January the system had a proved continuous actual capacity of 108,000,000 cu. ft. a day, officials said.

To finance the project, the gas company last year borrowed $1,300,000, and this year will spend an additional $800,000, according to Mr. Johnson.

Coating Memphis Natural Gas Co.'s new 18-in. line near Memphis, Tenn.

The pipe is being strung by the N. A. Saigh Co., of San Antonio, Texas, general contractors. Through the delta, the terrain is fairly flat, but in Louisiana the many small streams complicate construction. The company is using 1500-lb. river clamps.

The pipe is strung on the rights-of-way and welded continuously with electric welding. Every six miles it is broken by a Dresser insulating sleeve. Youngstown Sheet & Tube Co. and the National Tube Co. are supplying the pipe for the project.

Other firms supplying material used on the project are Clark Bros Co., compressor manufacturers; The Barrett Co., and Wailes-Dove-Hemiston Co., pipe protection manufacturers; Dresser Manufacturing Co., coupling manufacturers, and Walworth Co., valve manufacturers.

A cleaning machine follows the welding crew and the pipe is cleaned and primed. A Johns-Manville machine then coats the pipe with hot black enamel. The pipe whitewash to protect the enamel from the sun's rays is then applied.

All the pipe was shipped by barge down the Mississippi from the mills near Pittsburgh, Pa. Part of the pipe was unloaded at Memphis and part at Greenville, Miss. A third load was hauled down the Mississippi to the Ouchita River, when it was moved by barge up to Monroe, La.

In the area to be served by the Memphis Natural Gas Co. is a total estimated population of 417,000. The total estimated number of meters to be served is 57,000, including domestic, commercial and industrial.

The company line serves four towns in Louisiana, five in Arkansas, 16 in Mississippi, and six in west Tennessee, including Memphis with its population of 291,000. Memphis and all the towns in Louisiana and Arkansas first began using gas in 1929, when the line was opened. In west Tennessee all towns, outside of Memphis, were added in 1931. Nine Mississippi towns were on the line when gas was inaugurated in 1929, and the remainder of the 16 have been added since that time.

■ ■

Natural Gas Pipeline Co. Completes Loop to Chicago

The Natural Gas Pipeline Co. of America, Chicago, has completed an 88-mi. 26-in. loop on the 24-in. pipe line to Chicago, Ill. The loop extends from a point 12 miles south of Meade, to a point near Kinsley in western Kansas. This loop and a 33-mile lateral from the main line near Spearman, Texas, to the company's new compressor station in Moore County, Texas, was constructed by W. A. Bechtel Co.

Southern States To Be Served By 1400-Mile Line

VITAL to the national defense program is the 1426-mile natural gas pipe line proposed by the Tennessee Gas & Transmission Co. which will extend from southern Louisiana to Tennessee and western North Carolina. The proposed line is to pass through northwestern Alabama into south central Tennessee and thence into North Carolina. (See map on this page.)

The line would serve the Tennessee Valley Authority at Muscle Shoals along the Alabama-Tennessee border, the aluminum division of the Reynolds Metal Co. and the phosphate industry, source of basic chemicals for high explosives and fertilizer, in southern central Tennessee and the Aluminum Co. of America east of Knoxville.

The Tennessee Valley Authority, with which the company is actively negotiating for sales of substantial quantities of gas, would use the gas at Muscle Shoals for making steam which, in turn, would be used for the production of electric power. This would provide the TVA with a conservative factor in protecting water levels which have been dangerously low. Private industries along the route, including the aluminum companies, have expressed their need and desire for natural gas.

In addition to serving defense industries whose products are of immediate concern to the federal government, the system would likewise serve a growing area with 800,000 inhabitants who are now without natural gas. A score of laterals will carry gas to numerous communities including three large cities, Nashville, Chattanooga and Knoxville.

Curtis B. Dall, president of the Tennessee Gas & Transmission Co., said that "the company, on completion of its major financing plans, will commence actual construction of the pipe line at the earliest possible date."

Tennessee authorities seem receptive to the plan since only a small section of the extreme western part of the state is now served by natural gas.

The project was given the green light in Washington when the Federal Power Commission dismissed the company's application for a certificate of public convenience and necessity "for want of jurisdiction." This is interpreted to mean that the Tennessee Gas & Transmission Co. is enabled to proceed with its plans without federal permit.

The line will start in the Jennings area of southern Louisiana where the company has arranged to acquire the major part of its gas. The company has entered into purchase contracts with Continental Oil Co., Standard Oil & Gas Co., Union Sulphur Co. and the Atlantic Refining Co. The contracts are for a 15-year period and represent the right to exploit proven reservoirs of 800,000,000,000 cu. ft. While they differ in some minor respects, the contracts are essentially uniform in character. Much of the gas will be obtained from deep distillate wells, now part of recycling projects. It is possible that the company may acquire additional reserves from time to time.

Cost of the line will be approximately $23,000,000. It will run northeast from the Jennings area along the Louisiana Gulf Coast, cross the Mississippi River near Natchez, pass through Mississippi and cross the northwest corner of Alabama into south central Tennessee. A branch will continue northeast to Nashville but the main line will turn east in Lawrence County, Tennessee, traverse the rest of the state and enter North Carolina where five western counties will be served.

Capacity of the system, built around a 16-in. high-pressure, electrically-welded main line, will be 110,000,000 cu. ft. per day. Compressor stations will be located approximately every 92 miles. The system will consist of a total of 1425.95 miles of line. Divisions of the line are as follows: main line, 845 miles; laterals, 470.5 miles; gathering lines, 95.5 miles; river crossings, 14.95 miles.

■ ■

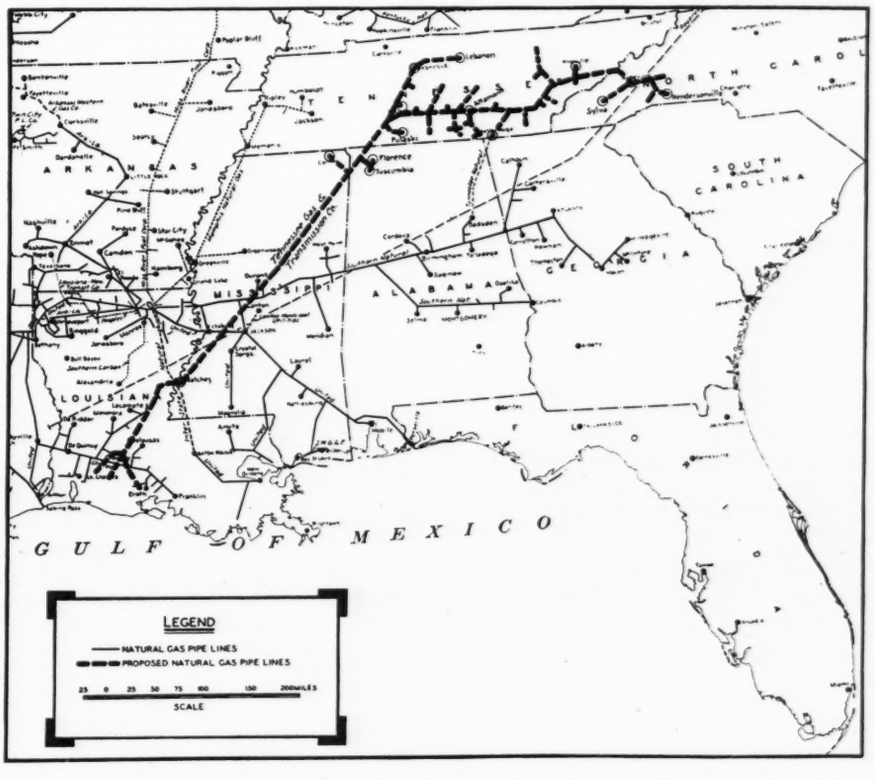
Cities Service Gas Co. of Oklahoma Builds 55-Mile Line

RAY STEPHENS, Inc., Oklahoma City, Okla., owners of a gas potential of 13,000 acres in the West Cement (Okla.) field, have secured the right-of-way for a 55-mi., 16-in. natural gas pipe line to be constructed by the Cities Service Gas Co., from that field to Oklahoma City.

Contracts will soon be let for the line which will start in Caddo county and connect with the transmission line of the Cities Service Gas Co. which carries gas northward from the Oklahoma City field to towns on its system in Kansas and the middle west.

Cost of the line is estimated to be in excess of $750,000. It will have a capacity of 90,000,000 cu. ft., and will connect to wells producing sweet gas of high gasoline content. The wells at present are producing under high pressure. They will be tested before a decision is reached on whether additional compressor station capacity will be needed. Construction of at least one dehydration plant to strip the gas of its natural gasoline is contemplated.

Several of the Ray Stephens, Inc., wells have gaged in excess of 100,000,000 cu. ft. daily. The company will construct gathering lines in the field to feed the new Cities Service line.



Along the course shown above by the dotted line, Tennessee Gas & Transmission Co. plans to construct a 1426-mile natural gas carrier, a line of vital importance to the defense program.

REGULATION OF GAS HOLDERS in California

1. First Year Operations Under the California Railroad Commission's General Order No. 94

By ARTHUR B. ALLYNE

Associate Engineer, California Railroad Commission

NO SMALL portion of the California gas utilities' total investment in their distribution systems is represented by the many holders and vessels which dot the state. This far-reaching network extending from Eureka on the north to San Diego on the south provides sufficient gas storage during peak periods to insure an adequate and continuous supply of fuel to the gas-consuming public. As these requirements are ever increasing, it is necessary that new holders be built from time to time and that those already in service be maintained in a first-class operating condition.

The construction, operation, maintenance and inspection of all gas holders and hydrocarbon vessels operated by public utilities in California are regulated by General Order No. 94 of the California Railroad Commission, which became effective April 1, 1940. In formulating the Order the Commission's staff was afforded the assistance of representative engineers of the industry, and as a result it is believed to embody the best of operating practices insofar as holders and vessels are concerned. While it is true that no serious holder accident has as yet occurred in California, experience elsewhere has indicated the wisdom of taking proper precautions throughout the life of the equipment.

The first year of operation of all holders and vessels under G. O. No. 94 has been completed, and it is felt a review of some of the things that have been accomplished during this period may be of interest.

There are at the present time 315 gas holders and hydrocarbon vessels in operation or under construction by public utilities which come under the jurisdiction of the Commission. Their type, number, and group capacities and unit installed costs are given in in Table 1.

It may be seen that the high pressure type gas holder costs somewhat more to originally install than the water seal type, but actual figures indicate that the maintenance cost of the high pressure type is very small in comparison.

Because of the requirements of the Order, the utilities have been put to considerable effort and expense during the past year in order to insure that their holders and vessels were in a first-class operating condition. The Order provided that during the first year after its adoption all high pressure holders which were more than 10 years old and all low pressure holders and hydrocarbon vessels which were in excess of 20 years old should undergo a complete and thorough inspection by an approved inspector not regularly in the employ of the utility. Provision was also made that under certain conditions inspections on holders and vessels of the above ages which have been made by the company inspectors prior to the effective date of the Order could be submitted and accepted in lieu of inspections by outsiders. Accordingly, up until July of this year complete inspection reports on 115 gas holders had been submitted to, and acted upon by, the Commission. Of this total 42 of the inspections were made by company inspectors prior to the effective date of the Order and 73 were inspections made by outside inspectors. These 115 inspections have been reviewed and either accepted or the utility advised of certain additional tests or repairs which were deemed necessary. These inspections are in addition to routine daily, weekly, monthly and annual inspections required by the Order and which are made by utility men but are not submitted to the Commission. In addition to the above complete inspections numerous others were made on holders which were subsequently abandoned, and therefore the reports were not submitted for approval. It can be seen from the above that the big burden of inspections has been during the past year and that the utilities will enjoy a respite for a few years until it again becomes necessary to go over their holders. This is illustrated by Fig. 1 which shows an inspection schedule by types of holders or vessels for a number of years in the future. In preparing this schedule advantage was taken of a clause in the Order which stipu-

THE CALIFORNIA STATE Railroad Commission's General Order No. 94, dealing with Regulation of Gas Holders, came into effect on April 1, 1940, and the annual convention of the Pacific Coast Gas Association at Del Monte, Calif., which meets September 10-12, 1941, provides an appropriate opportunity to report on and discuss the results of the first year's operation of this new regulatory step. Six papers were prepared for the "symposium" as follows:

1. "State Regulations of Gas Holders in California," by Arthur B. Allyne, associated engineer, California Railroad Commission.

2. "The Dewatering, Inspection, and Repair of a Two Million Foot Holder," by M. R. Thompson, vice president in charge of construction, Southern Counties Gas Co. of California.

A. B. ALLYNE

M. R. THOMPSON

3. "Results of 100 Holder Inspections," by Hughes Sneed, inspector, Oakland, Calif.

4. "A Gas Holder Purging Apparatus," by Harry J. Kneeling, Southern Counties Gas Co.

5. "Special Equipment for Inspection and Purging of Gas Holders," by Byron Millner, Pacific Gas and Electric Co.

6. "A Simplified Means of Purging Small High Pressure Holders," by K. B. Anderson, Coast Counties Gas and Electric Co.

The first three of these papers deal, respectively, with various aspects and developments of the operation of the Holder Order, details of inspection of a holder that was found to be severely deteriorated although outwardly in reasonably good condition, and general findings after inspection of numerous holders of all types; abstracts of these three papers are presented herewith. The latter three of these papers describe procedures and apparatus developed for the safe purging of holders for purposes of inspection and/or repairs; the data in these three papers will be published in the October issue of GAS.—Editor.

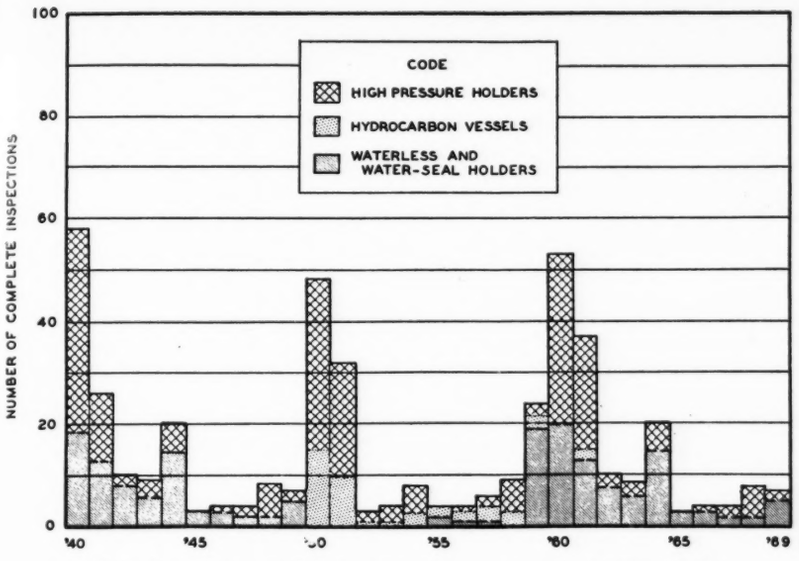


FIG. 1. Inspection schedule for all holders and vessels (1940 to 1969).

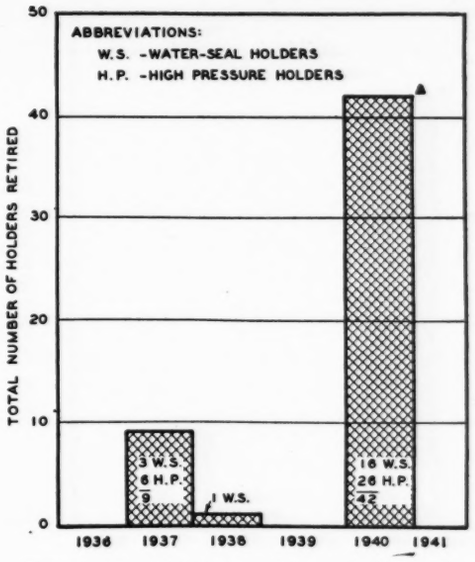


FIG. 2. Trend of holder retirements (1936-1941).

lates that at locations where groups of two or more high pressure holders or hydrocarbon vessels exist, of the same type of materials and design, built at the same time and subjected during the interval to identical service conditions, it is necessary to inspect only 20%, but not less than one, of the holders or vessels in any such group after each 10 or 20 years of service (10 years in the case of high pressure holders and 20 years in the case of hydrocarbon vessels). Of course, such a schedule as is shown in Fig. 1 will not be strictly adhered to because of retirements and additions which will inevitably occur in years to come.

Very few 20-year inspections have been submitted for hydrocarbon vessels because of the relatively few years this fuel has played a part in the gas industry. This type of equipment operated by utilities has in most cases been regularly inspected in the past by either the State Industrial Commission or insurance company inspectors deputized by that body, and since the Order provides for the acceptance of such inspections by the Railroad Commission the utilities will not be put to much additional effort in this regard.

The many complete inspections submitted to this Commission have produced some quite interesting results. Most of the utilities have made it a practice to regularly inspect their holders in the past, but in some instances this was found to not be the case. At some locations where internal inspections were found to be necessary the wooden landing frames were badly rotted and the holders in serious need of general repair. In other locations the inspector found the rivets holding the lift sheets together almost completely corroded away, and at one or two locations holders were found to have settled and to be tilting badly from vertical. The Commission approved inspectors had been previously advised that all such conditions must be remedied, and in every case where they were encountered the utility was requested to promptly remove the holder from service, and either make the necessary repairs or abandon it.

Partly as a result of this very thorough initial inspection program 42 gas holders operated by California utilities were abandoned during the year following the adoption of General Order No. 94. That this number greatly exceeds those of previous years is well illustrated by Fig. 2.

It should be pointed out that all of the 42 holders retired during the past year were not completely worn out or in a hazardous condition. Actually, each utility, appreciating the additional burden of maintaining their holders in accordance with the Order, made a survey of their system and "cleaned house," so to speak, of all holders which were in bad condition and would not warrant the expense of overhauling, and also those holders which were either too small or so unfavorably located that they served no useful purpose.

The high pressure holders abandoned were all quite small in size, in some cases having served as surge tanks at the outlet of manufactured gas plants, while the water seal holders retired varied in size from 7775 cu. ft. to 750,000 cu. ft.

Another phase of the holder work completed during the past year has been lighting with aviation warning beacons of all holders which were believed to constitute a hazard to aviation. This program was carried out with the cooperation of the U. S. Civil Aeronautics Administration. The Civil Aeronautics Administration was asked to make a study of the potential hazards of all gas holders in excess of 100 ft. in height. Upon receipt of the recommendations of that body, these were transmitted to the utilities, and as a result, 23 holders scattered throughout California are now equipped with aviation warning lights. The remaining 25 holders which were in excess of the height limit were exempt from lighting either because they were in close proximity to taller holders which were illuminated or they were adjacent to higher obstructions to aviation such as buildings or hillsides.

In order that the lighting of holders be of most value to aviation the location and description of each lighted

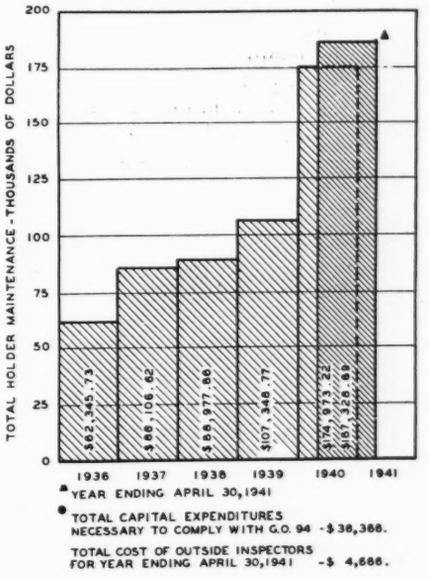


FIG. 3. Effect of General Order 94 on holder maintenance costs (1936-1941).

TABLE 1. GAS HOLDERS AND HYDROCARBON VESSELS IN OPERATION IN CALIFORNIA

Type of Holder	*Number*	*Total Capacity*	*Installed Cost* Per Storage Unit*
Waterless	3	33,700 000 cu. ft.	$ 64.37 per M c. f.
Waterseal	96	164,535,040 cu. ft.	86.94 per M c. f.
High Pressure	147	33,440,870 cu. ft.	110.51 per M c. f.
Hydrocarbon Vessels	69	874,284 gals.	18.90 per 100 gals.

*Approximate original cost completely installed, non-landed, but undepreciated and without utility overheads.

holder has been published in the regular publication of the Civil Aeronautics Administration, which is sent to all parties engaged in the use of the air lanes. It is our understanding that California is one of the few states where such a complete and successful cooperative lighting program has been carried out.

In reviewing the benefits which have been brought about as a result of the adoption of a uniform procedure for the operation and maintenance of all holders and vessels, it is of interest to determine the added expense burden placed upon the utilities. The items of added expense may be considered to arise from three sources, namely: added capital expenditures, increased maintenance expenses resulting mainly from repairs made necessary by the provisions of the Order, and the additional cost of the complete inspections made by outside inspectors.

Bearing in mind that public utilities in California have invested approximately 20 million dollars in their holders and vessels the total additional capital investment, in order to meet the requirements of the Order, has been approximately $36,400. The items which compose this total for the state consist mainly of aviation warning light installations, necessary fencing, purging and inspection equipment, etc.

The effect on holder maintenance costs, as a result of General Order No. 94, is shown in Fig. 3. It may be seen from Fig. 3 that holder maintenance costs have increased from year to year since 1936 at a rather uniform rate, brought about by two concomitant factors, the general expansion of the industry and the number of holders in service, whereas in 1940 and the year ending April 30, 1941, they were considerably higher. It is not expected that these maintenance costs, which, incidentally, do not include overheads or supervisory charges, will continue to increase in the magnitude of that experienced during the past year because of the fact that, as Fig. 1 shows, there will be a let-up in the total number of inspections and repairs which were necessary following the effective date of the Order.

The total holder maintenance costs shown in Fig. 3 for 1940 and the year ending April 30, 1941, include, in addition to added company maintenance, the amounts paid to outside inspectors and the cost of major repairs on a number of large holders.

The total amount paid by the utilities to outside inspectors during the year ending April 30, 1941, was $4666, which covered the cost of complete inspections on 73 holders, or roughly $65 for each holder inspected.

With the job of placing the holders of the state in first-class condition about completed the problem now turns to one of maintaining them in this manner, particularly during the present national emergency.

In studying the problems of camouflaging gas holders two definite impressions are at once obtained. The first of these is the difficulty and expense of providing adequate deception because of the size and shape of the structures, and the second is that no general procedure can be developed that will apply to all holders, each location requiring a separate solution of its own. In many cases the cost of constructing camouflaging screens or nets and their supporting members cannot be justified in comparison with the investment in the holder itself. For this reason it would appear reasonable first to do all that is possible in the way of camouflaging by painting and planting.

In locations were feasible, an intelligent tree planting program would serve three purposes, namely:

1. Make holder yards more attactive and thereby be an aid to public relations.

2. Eventually afford a screening effect of their own and, if sufficiently tall, partially distort the shadow cast by the holder itself.

3. Provide supporting members for other means of camouflage, such as screens and nets.

At yards where there is sufficient room for planting, evergreens should be used. Not only will this insure attractiveness of the site the year around, but also minimize the accumulation of rubbish and leaves.

Before attempting to develop a program of deception of any kind at a particular site, however, it is imperative that aerial photographs, made from different angles of approach and at various times of the day, be obtained. Only in this manner is it possible to study the treatment of the bothersome shadows cast by large objects such as holders, and to make the camouflaged object blend into the surrounding terrain and landscaping in the most effective manner.

In reviewing the work of the utilities during the past year under General Order No. 94 it is evident, from the cooperation obtained and the results effected, that all parties concerned are convinced that the additional effort and expense have been well justified.

2. The Dewatering, Inspection, and Repair of a 2,000,000 cu. ft. Water Seal Holder

By M. R. THOMPSON

Vice President in Charge of Construction, Southern Counties Gas Company of California

IT IS the practice of most gas companies to make periodical inspections of water seal gas holders from the outside only, assuming that any deterioration of the structure can be detected from the outside before it becomes serious. Our company, and possibly some others, has supplemented the outside inspection by purging the holder and making an inside inspection from a boat or raft operating on the surface of the water in the tank while the holder is inflated with air.

At Venice, Calif., we have a 2,000,000 cu. ft., four lift, steel tank water seal holder which was constructed 19 years ago.

This holder was used to store reformed natural gas from 1922 to 1927 and thereafter straight natural gas. For short periods some natural gas of rather high sulphur and oxygen content from the Venice and Playa del Rey fields was stored.

Periodical outside inspections were made at least once a year and in 1937 an inside inspection was made from a rubber boat. None of these inspections disclosed any indication of more than superficial corrosion and no deteriora-

tion of the structure was observed.

In February of 1939 we discovered several small holes in the 10-gage steel plates of the outer lift of this holder about half way between the top and bottom of the lift. These holes were all in one general location. The outside surface of the steel was perfect and the metal seemed to be sound everywhere except for a distance of a few inches from the holes, which indicated localized internal corrosion. As the holder was due for a 20-year inspection under G. O. No. 94 in 1942, and to put it out of service immediately would be inconvenient, we stopped the holes with soap and continued to use it pending the completion of the 4000 M.c.f. high pressure storage facilities we were installing in that district.

About a year later the cup of No. 3 lift fouled the grip sheet of No. 4 (outer) lift in the same general location in which the holes were found, and a serious accident was averted only by the alertness of our operator. We took the holder out of service, dewatered it, and made a detailed inspection. This inspection disclosed that although there was very little general corrosion, certain vital parts of the structure had been sufficiently weakened or damaged by wear and/or corrosion to cause lifts Nos. 3 and 4 to foul each other. These parts were totally inaccessible for inspection from the outside and the damage not easily detected from a boat on the surface of the water inside the tank.

Repairs and Replacements

The various parts of the structure which required repair or replacement were as follows:

1. The vertical stiffener legs on the inside of lifts Nos. 2, 3 and 4, which consisted of 6-in. channels, were worn and deformed where the bottom rollers contacted them. Some had worn through in places. These channels were attached to the lifts by clip angles riveted to the shell plates, one angle clip 30 in. long on each side of the channel for each course of shell plates. These angle clips and the shell plates to which they were riveted were in excellent condition. The channels were secured between these clip angles by ½-in. bolts, 8 in. long which passed through both flanges of the channel and through both angle clips. These bolts were made up tightly against the angle clips but did not rigidly grip the channels. Only the heads and nuts of these bolts were visible from the inside and showed no serious corrosion; however, many of the bolts were corroded or worn almost completely away for about one inch under the head and under the nut where they passed through the flanges of the channel. Some were completely worn through at these points and the heads or nuts, which looked perfect, could be knocked off with a light hammer blow. The holes through the channel flanges were much enlarged, in some cases to such an extent that they were no longer holes but notches extending from the edge of the flange almost to the web. This condition, of course, allowed the stiffener legs to move in and out between the angle clips as the rollers passed up and down them, and the lifts were deprived of the stiffening effect of these members and were more or less free to buckle when resting on the landing blocks. A 40-in. piece of one stiffener leg had broken out and fallen to the bottom of the tank. There was evidence that when this 40-in. piece of stiffener leg broke loose it bent the cup sheet of No. 3 lift which caused it to foul the grip sheet of No. 4 lift.

2. Many of the cotter pins that held the roller shafts in place in the bottom rollers were corroded or worn away. This allowed the shafts to be displaced which in turn caused the rollers to jam and slide on the stiffener legs rather than roll. The pressure of the rollers, which were barrel shaped, had bent the thin web of the stiffener leg channels inward.

3. The outer lift, when standing on the landing block and deprived of proper support, apparently buckled sufficiently to rub on the cup of the No. 3 lift as it passed up and down inside it. In a few spots the plates of the outer lift were worn through by this rubbing action. These were the holes we found in 1939. They were not the result of internal corrosion.

4. Most of the 28 4-in I-beam tank guides were found to be damaged by corrosion and contact of the rollers to an extent which necessitated their replacement.

5. When the holder was built shims were placed on the landing blocks to bring them to a common elevation. These shims consisted of steel plates with the edges bent down over the sides of the 10-in. I-beam landing blocks. Many of these shims had been lifted off the blocks and were lying on the bottom of the tank nearby. We assume that an externally applied grease collected on the bottom of the cups as the lifts came down into the water and was carried down to the landing blocks, and when the lifts were raised sufficient suction was caused by the grease to lift the shims off the blocks and carry them for a time, then as the suction broke the shims were dropped and without the shims the lifts, when landed, were not uniformly supported, which might cause buckling of the thin plates, which in turn would stress the weakened connections to the stiffener legs.

6. When the tank was dewatered we found many diagonal braces missing from the permanent frame which was constructed of timber except for the central tower which was of steel. These 2 in. by 8 in. rough Oregon pine members were found lying on the bottom in a water-logged condition. Investigation showed that the spikes with which they were held in place had corroded through. Some timbers still in place fell off when bumped into by the inspector in his boat. Several of these timbers had fallen on landing blocks while the lifts were up and were crushed to about one-half their original thickness by the weight of the lifts when they landed, and the landing blocks had been bent by the resultant overload. Of course, this also added to the tendency of the lifts to buckle when landed. It was fortunate that the important joints in the permanent frame of the welder were bolted.

Summary of Work

Our repairs consisted of repairing the permanent frame, replacing four landing blocks, shimming all landing blocks and tack welding shims so they could not again be displaced, replacing 84 stiffener legs (new members were welded to clip angles instead of bolted), replacing 84 bottom rollers and carriages with ones of newer design with flat surface rollers and rigidly fastened axles, replacing 28 tank guides and rollers, replacing and repairing several 10-gage plates in lifts that had been damaged by rubbing, straightening cup, grip and dam sheets, and adjusting all guide rollers.

The holder was out of service for a full year. The permanent frame was repaired by our own crew while we were deciding what to do and how to do it. We finally employed the original builders of the holder (an internationally known eastern firm) to do the job, and actual repairs to the steel structure required four and one-half months after material, equipment, and crew arrived on the job.

The cost of these repairs will exceed $30,000.

The lessons to be learned from this experience are:

1. Inspections from the outside alone will not disclose deterioration of vital parts of the structure.

2. Inside inspection from a boat on the surface of the tank water must be very carefully made and even so there

are some vital parts that are submerged and cannot be inspected.

3. The only way complete inspection can be made is by inspection from the outside and inside of lifts before dewatering, then dewater and inspect permanent frame and landing blocks, tank bottom, tank guides, etc.

4. Where there is any movement between adjacent parts, corrosion is rapidly accelerated.

When new structures are contemplated, insist:

1. That permanent frame timbers be either bolted or spiked with corrosion resisting spikes.

2. That landing block shims be under the blocks or securely fastened in place.

3. That stiffener legs and tank guides be rigidly fastened in place so that there can be no movement between any of the adjacent parts.

4. That axles of bottom rollers be rigidly fastened to roller carriages at both sides of roller. Loose shafts held in place with cotter pins should be prohibited.

5. That lifts be so constructed that they will stand on the landing blocks without buckling or deforming. This can only be controlled by the erection crew and requires very careful riveting by skilled workmen.

6. That tank bottom plates under the landing blocks be firmly supported by grout so that after the landing blocks have once been shimmed up level and all set at one elevation, none of them will be depressed when subjected to the full load of all lifts and the tank filled with water.

The cost of careful inspection by an experienced and conscientious inspector during erection is well justified.

3. Conclusions Following the Inspection of 100 Low and High Pressure Holders

By HUGHES SNEED

Inspector, Oakland, California

IN APRIL, 1940, I became engaged in the work of Independent Inspector of gas holders and hydrocarbon vessels for the gas utilities of California.

I might emphasize that General Order 94 (which may have appeared unnecessary to some at the time it was issued) has had the effect of turning the attention of those concerned with holder operation to the general condition of their holders. Maintenance crews have been imbued with the importance of this work. Before the Order went into effect there was, in some towns, no systematic check-up on the holders, such as lubrication, seeing that the proper amount of water was in the cups, etc.

I had not formed any preconceived ideas as to what I might find on the holders but in looking back over the work I find the most prominent defects that stand out in my mind are connected with the following items:

Low Pressure Holders

Tank Corrosion: On the steel tanks former corrosion was found in many of the older holders at the water line of the top course and the tank guides at this level. This was stopped some 20 years ago by placing anti-corrosive compound in the tank.

Loose rivets or slow leaks in the caulking edges in some places caused the paint to fail and small corroded places appeared.

Around the bottom curb where drainage was not good, continued corrosion was found mostly due to the original corroded spots not having been properly cleaned before painting. The standard supports of some of the earlier designed holders are attached to the holder in such a manner that they cannot be cleaned and painted satisfactorily. However, little corrosion was found at these points.

The tank walkway in some cases was badly corroded due to water standing in low places; a hole drilled at these points will provide drainage and prevent this.

Guide Frames: The most frequent places for corrosion on the guide frames are the horizontal members. In many places where the rivet spacing is wide, corrosion has caused a buckling of the plate between rivets. This condition usually occurred at the top of column plates, stairway landings and platforms on the girders. The stairway ladders and handrail were generally in good condition.

In some cases there were indications of the use of some extra weight being used on the crown to give the holder more pressure or for a counter balance. At these points there was some former corrosion.

In fighting corrosion, pigeons must be taken into consideration. The guide frame and carriage frames are usually cluttered with their nests and manure. The maintenance men are continually after them and on many of the holders screens are used to prevent nesting.

Crowns: The crown, in most cases, is in very good condition. In some of the smaller holders there was evidence that they had been neglected and allowed to corrode in small areas. The intermediate courses in the lifts were generally good. Coupons taken in the crown and lifts of all holders inspected showed practically no internal corrosion. Of all the holders inspected only one showed the rivet heads in the damsheet grip channel connections to be entirely corroded off. Another holder was taken out of service for repairs at these points. Many of the older holders show former corrosion at these points. Since a protective compound is now used on all lifts this trouble has been eliminated.

Carriages: Pressure lubrication systems are now generally in use. There are some of the older type holders which use oil where it is not practical to connect them to the pressure system. In both cases, along with checking the water in the cups, they are attended to as prescribed.

The top carriage wheels, in many cases, had repairs made to them such as new wheels, wheels rebushed, and new shafts. These have been fairly well maintained. The bottom carriages of the outer section were the most neglected due to being submerged in the water and no inspection having been made. At some stations these were kept in good condition while at others many were entirely off due to their design. Sand blasting should not be permitted on a holder. It is almost impossible to keep the sand from the bottom roller bearings, cups, and from the tank where it builds up on the landing beams causing the lifts to land improperly.

While most of the holders inspected appeared to have been well constructed, the poor operation of others could be traced to faulty design and improper construction in the field.

High Pressure Holders

The high pressure holders were generally of good appearance and located in clean yards. Where conditions did not meet with the provisions of Order No. 94, such as combustible material stored under or near the holder, this was removed or arrangements made to do so.

Where internal corrosion was found in these holders the cause, in practically all cases, was from poor drainage which caused liquid and dirt to collect in the bottom of the holder.

Summer Air Conditioning

7. Factors Which Influence the Selection of Gas-Using Air Conditioning Equipment

By JAMES C. PATTERSON

Manager, Dehydration Department
Carrier Corporation, Syracuse, New York

THE previous six articles of this series on gas-using summer air conditioning equipment covered the operating principles and commercial utilization of both *adsorption* and *absorption* dehydration or dehumidifying equipment and *absorption* refrigeration equipment.

This final article reviews these several thermal air conditioning methods and outlines the effect of such factors as: costs of gas, steam or power, temperature and cost of water, desired humidity and temperature, etc., on the choice of these several methods for a given application.

This article also includes a discussion of compression refrigeration in order to broaden the scope of this series.

At the outset it should be understood that there is no single system (gas, steam or electric) which may be considered suitable to all applications. It is practical, however, to set up and discuss the principal factors which influence the *choice* of the several methods now available to the gas industry.

There are two general classifications of heat actuating or thermal air conditioning methods, each made up by two basic types. These are:

1. The Direct Dehydration Method, using solid adsorbents or liquid absorbents.

2. The Refrigeration Method, using the absorption or the compression type.

The Dehydration Method

Dehydration, like dehumidification, denotes abstraction of water. What, then, is the distinction? This distinction may be said to lie in the *medium* which causes the abstraction of water.

Dehumidification is generally associated with cooling air below its dew point temperature, and thus condensing water vapor out of air. This is accomplished by passing air over a cold surface or through a cold spray produced by refrigeration. The extent of dehumidification by this method is, therefore, dependent upon the extent of temperature reduction.

Dehydration, on the other hand, is generally associated with equipment containing certain solid or liquid desiccants of the regenerative type which have the ability literally to extract water vapor from air brought in contact with such desiccants. This is accomplished *without* the use of refrigeration.

The most widely used of the solid adsorbents are silica gel and activated alumina. These substances are extremely porous. Moisture is attracted by, and adheres to, surfaces within the submicroscopic pores in these substances without in any way changing their physical characteristics. This adsorbed moisture can be readily driven off by the application of heat.

The liquid type of absorbents functions somewhat similarly. Lithium chloride brine is the most widely used type. Such a brine in contact with moist air of higher vapor pressure picks up moisture from the air until the increasing vapor pressure of the solution approaches the decreasing partial pressure of moisture in the air. With air of lower vapor pressure, of course, the reverse action takes place, with humidification of the air.

The choice of method, as between the solid and liquid types, depends upon: the degree of dehydration that is to be accomplished, kind of application, and availability and cost of manufactured or natural gas and the availability and cost of high or low pressure steam.

In general, it may be stated that the smaller the quantity of outside air to be dehydrated in proportion to the total quantity of air to be circulated, and the greater the extent of dehydration required, the more favorable becomes the solid adsorption type. By the same token, the larger the quantity of outside air in proportion to the total, and the smaller the extent of dehydration required, the more favorable becomes the liquid absorption type. It is for this reason that the liquid absorption method must compete with the refrigeration method to a much greater degree than is the case with the solid adsorption method.

In either case, the dehydration method of removing water vapor from air or other gases is of greatest value where: (1) it is desirable to maintain humidity conditions independently of dry bulb temperature conditions; (2) it is essential to provide precise control of the absolute moisture content in air directed to or surrounding an industrial process; (3) there exists a comparatively large percentage of latent heat load to the total load; (4) cold tap or well water is available for cooling purposes; (5) it is practical to take advantage of operating economies through the use of gas or steam heat.

Since the principal function of dehydration is to produce dry air and maintain dew point temperatures independently of cooling, this method must be qualified economically as well as technically, in the light of that limited function, before it can be properly selected instead of refrigeration, regardless of type.

For example, when the extent of dehumidification required for any one

J. C. PATTERSON

JAMES C. PATTERSON, for the past 15 years a pioneer in dehydration methods of air conditioning, has been prominent in the activities of the American Gas Association and many individual gas utilities in furthering the development and acceptance of gas-using equipment for air conditioning. Since 1937, which also marks the beginning of his present association with Carrier Corp., he has continued as vice chairman of the Association's Air Conditioning Committee. The air conditioning industry claimed Mr. Patterson 17 years ago when he joined the Silica Gel Corp., developer of the adsorption method of dehumidifying. From 1929 to 1934 he was vice president of that corporation. In 1934, with Bryant Heater's acquisition of certain rights to use silica gel, Mr. Patterson became manager of Bryant's air conditioning division. Mr. Patterson was graduated from the University of Pennsylvania in 1915 with the degree of B. S. in M. E., and in 1931 received an honorary technical degree from that university. With this treatise by Mr. Patterson, GAS concludes its series of seven articles on gas-fired summer air conditioning equipment.—Editor.

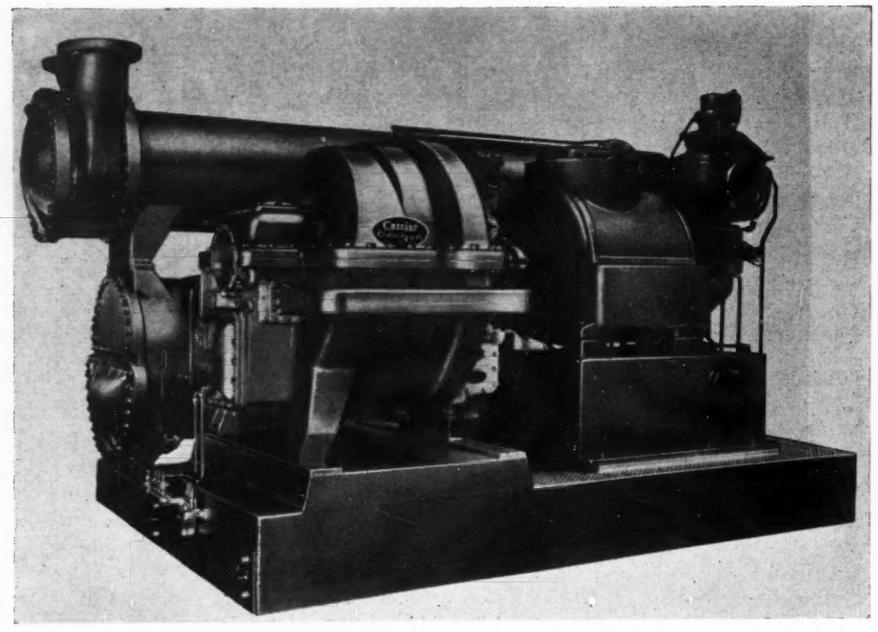


FIG. 1. Carrier turbine-driven centrifugal compressor.

specific application need not go beyond that obtainable as a *by-product* of low temperature cooling, the conventional refrigeration system is likely to be lower in first cost as compared with a dehydration system designed for the same duty. Dehydration could not be economically qualified for such applications unless its probable higher first cost could be compensated by lower operating cost resulting from favorable water temperature conditions coupled with low cost gas or steam.

On the other hand, when the extent of dehumidification must provide for the maintenance of a constant inside absolute humidity against comparatively large internal moisture sources, coupled with higher than usual outside moisture design conditions, the dehydration system is likely to be lower in *overall* cost than the refrigeration system designed for the same duty. It should be mentioned, however, that it is not uncommon to find that a dehydration job is a "premium" job in so far as first cost is concerned.

There is also the question, How much of the dehumidifying should be accomplished by dehydration equipment? For instance, there are many cases where it will be more economical to remove a part of the latent heat by the cooling medium (cold water or refrigeration) and to use dehydration for the removal of the remainder.

Because of the necessity of weighing these and other variables in the light of conditions of use, it is impractical to set up *fixed rules* regarding the initial cost of the dehydration method as compared to the refrigeration method. Yet there are certain influencing factors which definitely reflect upon such cost comparisons. These are:

1. *Kind of Application:* In cases where the sensible heat load varies over wide limits and where it is desirable to maintain control of relative humidity within narrow limits, dehydration is generally more favorable.

In cases where the conditions of use require the maintenance of dew point temperature between approximately 37° and 43° F., or the maintenance of relative humidities over a range of between 10% and 50% at dry bulb temperatures above 80° or below 60° F., dehydration is usually the choice.

For the maintenance of dew points below 37° F., dehydration is practically an essential.

2. *Water Temperature:* It is practical to use water for all sensible heat removal in combination with dehydration when the temperature of the available water is at least 15° F. below the dry bulb temperature to be maintained. With decreasing water temperatures, the scope of application increases, and the economic advantage of using dehydration equipment becomes more apparent.

In the absence of a sufficiently cool water supply for temperature control purposes, the evaporative cooling principle may be employed, or more generally, mechanical refrigeration would be used to take up all or any part of the sensible heat load which cannot be removed economically by water.

3. *Utility Services:* The relative unit costs of gas, steam, electricity, and water coupled with the extent of utilization, bear directly on cost of operation and, in many cases, are the deciding factors.

Where the unit cost of gas or steam is low as compared with electric power, the operating costs of dehydration can be capitalized to good advantage.

In comparing the total cost of utility service as required for the dehydration method with that required for the electric refrigeration method, consideration should be given to all demand charges as may apply.

An increasing number of electrical utilities are becoming concerned with the fact that with the all-electric system the power consumed is only a small part of the connected load. This results in an unprofitable load factor.

On the other hand, the gas utility is distinctly interested in promoting the use of gas air conditioning equipment because the resulting load is "off scale" and therefore very desirable.

The seasonal load factors for both gas and electric utilities may be improved by using gas-operated dehydration equipment.

The Refrigeration Method

As with dehydration, there are two basic types of refrigeration. These are the absorption type and the compression type.

The April, July, and August issues of *GAS* carried comprehensive articles on the former as developed and manufactured by Williams Oil-O-Matic, Mills Novelty, and Servel, Inc., respectively. For these reasons a brief description of the absorption refrigeration cycle will suffice here.

Refrigeration by this method is accomplished through absorption of the evaporating refrigerant vapor at the low temperature or cooling level by a liquid absorbent having an affinity for the vapor. This solution, now a mixture of absorbent and refrigerant, is pumped to a "regenerator," where the refrigerant is separated from or distilled out of the absorbent by heat. The released refrigerant vapor then passes through a "condenser" and is reduced to a liquid state. In this condition, it passes through a conventional expansion valve into the "evaporator" where it again performs the cooling function. Simultaneously, the liquid absorbent has been returned to a condition (by heat) where it is capable of again absorbing the refrigerant vapor.

Absorption refrigeration has a definite place in the economy of air conditioning and will undoubtedly develop a place of increased importance in the industry, particularly in connection with residential comfort cooling.

Conventional compression equipment

is generally associated with electric prime movers. The fact is, however, that there is broad application for the use of gas in connection with this type equipment. This is particularly true with the turbine-driven compression system where, in numerous cases, gas is used in producing the required steam energy.

The compression system permits the choice between several types as well as a choice of the kinds of energy that may be used for the particular application. For the compressor system the following types are available: (1) centrifugal compressors driven by electric motors or steam turbines; (2) reciprocating compressors driven by electric motors or gas engines; (3) steam jet (vacuum) type, using steam as motive power.

The proper selection as to type will depend upon: The amount of refrigeration required, the degree of temperature reduction, and comparative overall costs. Furthermore, the influencing factors previously outlined with particular respect to dehydration, bear on the choice with respect to refrigeration.

The centrifugal machine is particularly applicable to chilling water for both comfort cooling and industrial air conditioning. It is also applicable and is used extensively for low temperature industrial refrigeration for chilling of brines, direct cooling of products such as beverages, sugar solutions, etc., and the direct condensation of vapors at low temperature such as chlorine liquefaction and condensation of other refrigerants.

The capacity range is from 100 tons to 1200 tons in a single machine and in the case of multiple machines for jobs involving thousands of tons of refrigeration. The speeds of these machines range from 7500 r.p.m. for the smallest machines down to 3500 r.p.m. for the largest machines. It is to be noted that the speeds of these machines are ideal for direct connection to steam turbine.

In many cases the steam turbine can be fitted into the heat balance, particularly for industrial applications. Furthermore, in office buildings, department stores, etc., where large quantities of hot water are required, a simple steam turbine can be used exhausting steam at say 5 lbs. pressure. In the New Orleans territory, throughout Texas, and in scattered locations in the Middle West, there are many comfort installations where centrifugals have been installed with steam turbine drive with either artificial or natural gas burned under the boilers.

The reciprocating machines are also used on these applications, but are used almost exclusively in connection with electric motor drive. They are not suitable for steam turbine drive. The "Freon" reciprocating equipment is priced just about the same as centrifugal refrigeration equipment, with the exception that the centrifugal is slightly higher in the smaller tonnages and lower in the larger tonnages.

Steam jet refrigeration equipment is limited to those applications where it is practical to condense steam as distinguished from those applications where it is desirable to use exhaust steam for other purposes. It does not fit into heat balance applications. Because a steam jet machine requires about one pound of steam to pump two pounds of vapor, its thermal efficiency is lower than the usual turbine efficiency.

The first cost of steam jet equipment is usually somewhat less than the first cost of turbine-driven centrifugals. However, on an owning and operating cost basis, the centrifugal shows better economy and lower overall cost.

Power cost comparison: Steam turbine-driven centrifugals versus electric motor-driven compressors.

Assumed Conditions

Steam pressure at throttle = 150 lbs. ga. saturated.
Operation = condensing at 27-in. vac.
Steam rate = 15 lbs. Bhp. per hour.
Horsepower = 600.
Motor efficiency = 93.2.
Load factor neglected in both cases.

Steam Cost in Cents Per 1000 Lbs.	*Equivalent Electric Power Cost in Cents Per KW Hr.*
15	.28
25	.46
35	.65
45	.83
55	1.02
65	1.20
75	1.39
85	1.57
95	1.76

Because the centrifugal machine is so well adapted to steam turbine drive, Carrier has promoted this form of drive for many years. Fig. 1 shows such equipment. Also, as previously mentioned, the steam required for many such installations was generated by gas-fired boilers. As a result, it can be estimated that this *indirect* use of gas (for turbine-driven centrif-

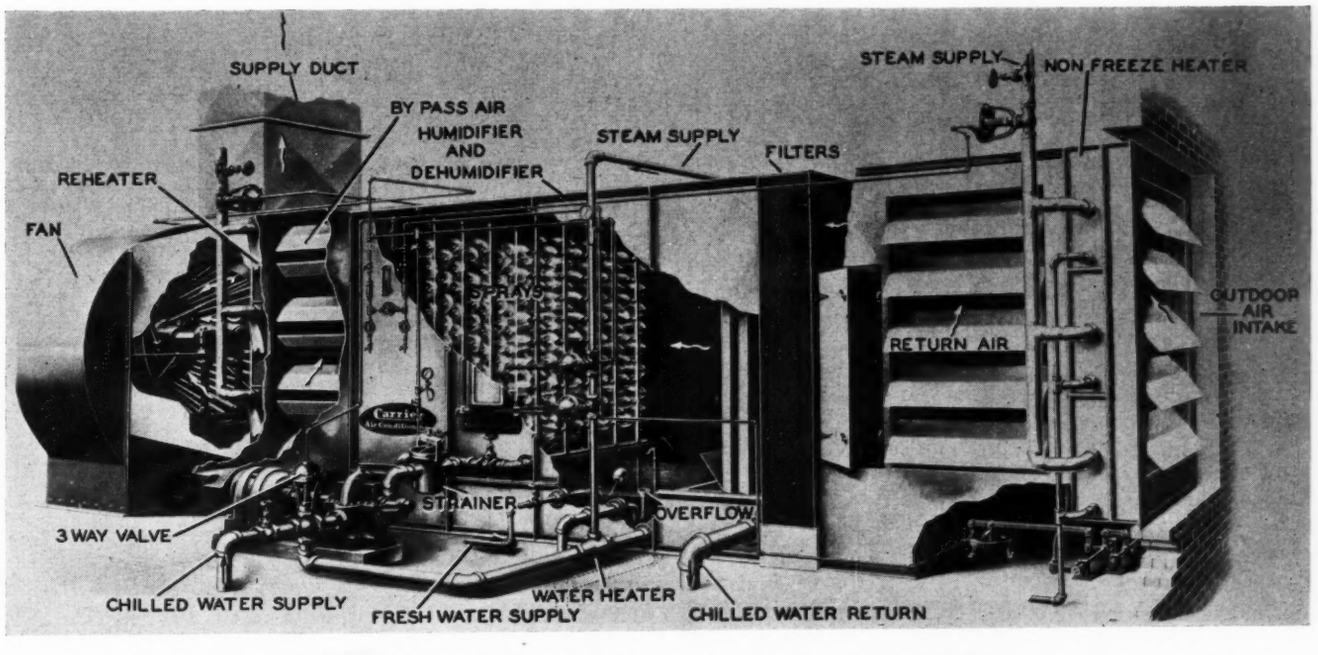


FIG. 2. Schematic drawing of Carrier central station air conditioning system.

ugal machines) represents over 60% of the total used in all other gas-using air conditioning equipments combined. A significant point—not generally recognized by the gas industry.

Dehumidifying by Refrigeration

There is a choice as to method of dehumidifying by these several types of compression refrigeration. That is, condensation may be accomplished by spraying chilled water in direct contact with air, or indirectly by means of cold surface made up of spiral wound or plate finned air cooling coils or a combination of both spray and coils.

Fig. 2 is a schematic drawing of the Carrier central station air conditioning system, including chilled water spray. The equipment provides heating or cooling, humidifying or dehumidifying, cleaning and circulation of the air.

Air enters the system through the outdoor air intake and passes through the non-freeze heater. Steam is automatically supplied to the non-freeze heater when outdoor air temperature would endanger the freezing of the spray water. Return air is mixed with outdoor air and the mixture is then drawn through the humidifier and dehumidifier. Volume dampers, automatically controlled, regulate the percentages of return and outdoor air used.

The air passes through the filter where the dust and dirt is removed, and then enters the humidifier-dehumidifier through baffles which distribute the air across the section. From this point it is drawn through the sprays where it becomes saturated with moisture at about the leaving water temperature.

The saturated temperature of the air is its dew point control. When the required dew point temperature is higher than the temperature of the supply water, the spray water is heated by the addition of steam, the steam entering the circulated water at the water heater. When the required dew point temperature is lower than the temperature of the supply water, the spray water is cooled by introducing chilled water, the chilled water entering the circulated water circuit at the three-way valve.

A thermostat, located in the air stream beyond the sprays, controls the dew point of the air by establishing the required spray water temperature. This thermostat controls the operation of diaphragm valves to add steam or chilled water as required to keep the spray water temperature constant.

When water is evaporated into the air, make-up water is supplied through the fresh water supply. When moisture is condensed from the air, the excess water spills out at the overflow.

When the air, saturated with moisture at the required dew point temperature, leaves the sprays, it passes through eliminator plates where entrained moisture is removed. This prevents drops of water being carried in the air stream. Recirculated air, not passed through the humidifier-dehumidifier enters the apparatus through the by-pass air dampers.

The purpose of the by-pass is threefold — to permit operating economy during partial load operation; to increase the total air supplied to the conditioned space; to insure proper air distribution without increasing the size of the humidifying or dehumidifying equipment; and to allow circulation of a constant quantity of air under all load conditions, thus avoiding drafts, cold spots, or overheated areas.

The mixture of by-pass air and air from the humidifier-dehumidifier passes through the reheater. Steam supplied to the reheater is automatically controlled by a room thermostat.

The conditioned air is drawn into the fan which discharges it into the supply duct for distribution to the spaces which are to be air conditioned.

Because the chilled water spray type of dehumidifier saturates the leaving air more effectively, it is almost invariably selected for those industrial applications requiring precise control of dew points within the narrow limits. The lowest practical dew point, however, would be at 40° F. For lower dew points, the addition of a brine spray or dehydration equipment would be required. In such cases the latter is likely to be the more desirable choice from an operating and overall cost standpoint.

With the cold surface coil type, the dew point is depressed below the dry bulb temperature of the leaving air. The extent of this depression, however, varies with the design of the coil and its bypass characteristics, and the practical temperature range through which condensation takes place. This type would usually be selected for those applications where reasonable fluctuations in dew points or relative humidity is not a serious consideration, or where it is advisable to obtain local control of variable conditions at scattered points.

This is also the type cooling system that is used in combination with dehydration equipment to give independent control of humidity and temperature. In such cases the surface coils need have only sufficient capacity to produce cooling *above* the dew point and thus approach the maximum in operating efficiency.

There are many dehumidification problems where various types of refrigeration are normally used, and which involve the maintenance of high relative humidities (above 70%) combined with sub-normal dry bulb temperatures. This is an exclusive field for refrigeration.

It may be concluded then, that both the dehydration method and the refrigeration method have their individual favorable spheres of application and that the choice is essentially dependent upon the influencing factors discussed.

■ ■

Institute of Gas Technology Announces Fall Fellowships

THE Institute of Gas Technology, which was created on July 1 by the industry and is affiliated with the Illinois Institute of Technology of Chicago, Ill., has announced that during this year, 10 four-year fellowships will be available to engineering graduates holding Bachelors degrees from accredited colleges. These fellowships will pay $1000 for nine months, less $325 for tuition. Hence, fellows will receive in addition to their tuition, $75 per month. Additional positions paying $125 per month will be available for the three summer months.

A fund of $1,000,000 has already been appropriated for the new institute, the objectives of which are as follows:

1. Education on the graduate level with a program leading to a PhD in four years.
2. Fundamental research for the gas industry.
3. Organization and dissemination of scientific information pertinent to the gas industry.
4. Specific research projects for individual companies in the gas industry.

The Institute's fall term will open on September 22, and applications for these scholarships should be made immediately to: The Institute of Gas Technology, 3300 Federal St., Chicago. These applications must be in the hands of the Institute of Gas Technology by September 10.

■ ■

California Companies Raise Salaries of 5542 Employees

Southern California and Southern Counties Gas companies, Los Angeles, have announced a special "defense period wage adjustment," providing a general pay increase of $7.50 a month, effective August 1, to everyone regularly employed by either company who receives less than $300 a month salary.

According to officials, 5542 men and women in the two organizations will benefit by the increase.

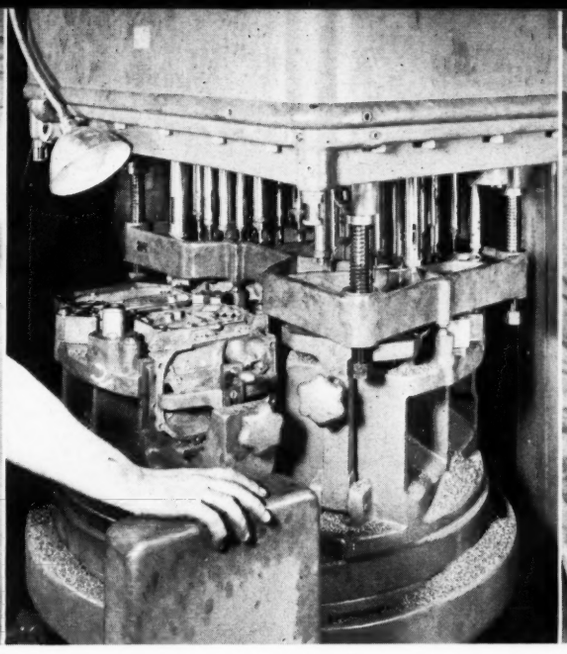
"The current increase," the officials stated, "is based upon the desire of the companies, so far as possible, to maintain the 'real wages' and living standards of its employees."

■ ■

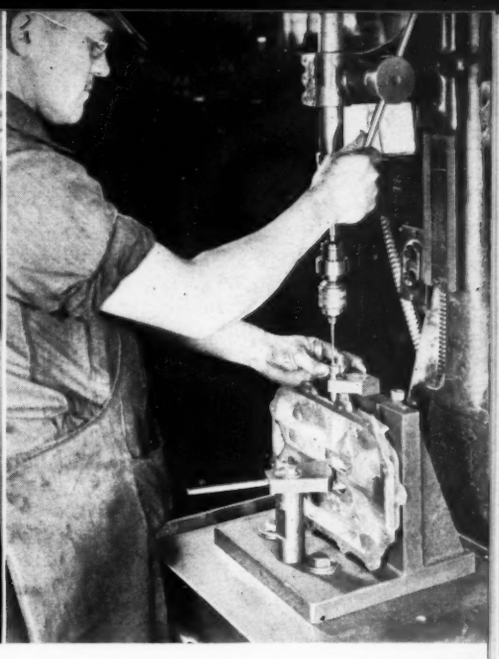
Pineville Gas Co. Seeks to Install Distribution System

J. C. Evans, manager of the Pineville Gas Co., Pineville, W. Va., has filed application for a certificate of convenience and necessity to install and operate a gas distribution system in the city of Pineville, Wyoming County, W. Va.

1. Tooling for the Emco Valve Plate. The head is raised while the table is rotated.



2. The head in drilling position. Six operations, involving 44 holes, are performed at the same time.



3. Side drilling operation showing the jig used to do the final machining.

Modern Production of Iron Gas Meters

By ALLEN D. MacLEAN

Vice President and Chief Engineer, Pittsburgh Equitable Meter Co., Pittsburgh, Pa.

THE process of manufacturing a product in large quantities becomes rather a complex matter under our present industrial system. The growth of so-called "high production" methods, a typical American development, has resulted from the application of the economic theory of the "division of labor." By limiting the task of each individual to a rather small operation, by intelligently planning the sequence of operations, and by providing the necessary tools and equipment, a group of individuals can build a quantity of a given product much cheaper and very much better than if each individual worked to build the entire product alone. The extent to which this theory can be applied and the benefits derived therefrom is apparent in the automobile industry. Here we have a large quantity of an extremely complex product, produced accurately and sold at an amazingly low price. Intricate machines, gages, jigs, dies, and tools are first provided, and, with these adjuncts, fabrication and assembly of the parts can proceed with extreme accuracy at a high production rate.

It is obvious, to apply these methods and to derive the full benefits of this type of manufacture, two factors are fundamentally necessary. First, the product must be built in sufficiently large quantities to justify the expense of the production tooling, and second, the design must be standardized so that all parts can be built and assembled on the same equipment.

To the uninitiated, a manufacturing plant consists of lathes, drill presses, boring mills, draw presses, etc., with operators to run these machines; and the average person inspecting a manufacturing plant would see just these bare essentials. To one acquainted with manufacturing, these bare essentials are only a part of the story. To use the equipment to its maximum advantage, there must be fixtures in which the work is held while the machining operations are being performed, and the operation must be carefully guided and limited by jigs. There must be small tools, quite often of special design, to perform the operations; inspection gages must be provided to check the accuracy of the operation. In draw press work, there must be hardened punches and dies to which the work is blanked and formed. In molding parts, hardened steel molds of a high degree of accuracy must be first built. Practically every operation in a modern manufacturing plant, although done on a standard machine, employs special tools, dies, jigs and fixtures to assist in arriving at the necessary accuracy and high production rate.

To what extent tooling can be carried out depends on the quantity of product built. The general acceptance of the Emco gas meter has, in recent years, increased the production rate to a point where practically every production device which will insure higher accuracy and faster production rate can be applied. From the initial machining of the casting, down to the shipping of the finished product, the processes have been carefully analyzed and the most advanced methods of fabrication have been employed. These advanced methods, while speeding up production, have the very important added advantage of increased accuracy. Since all parts are machined with accurate tools, and since the assembly operations are done with jigs to insure proper inter-relation of parts, the quality of the product is also of an extremely high order.

In the design of the Emco cast iron gas meter, practically all moving parts are supported and located from a single piece called the valve plate. This is a rather complex grey iron casting and the machining of the valve plate is shown in Figs. 1 and 2. There are in this valve plate 44 holes, of which 30 are tapped for screws. Accuracy in performance of this meter requires that all holes and machined surfaces be very accurately located, and interchangeability must be rigidly observed. The machining of this valve plate illustrates the application of advanced methods and specialized tooling.

Fig. 1 is a view of the work table of the machine used to do most of the drilling on this piece. There is one loading station (at the left of the picture) and two operating stations. At the loading station a valve plate is inserted and clamped and, after the table is rotated 120° clockwise to the first working station, a certain number of the 44 holes are drilled in it. The entire work table is then rotated (after a second valve plate is inserted at the loading position) another 120° clockwise to the second working position and an additional number of holes is drilled. On the next movement of 120°, the work is back at its original loading position, where the operator turns the work over on the opposite side and places it in an adjacent locating jig on the table. At the same time the operator places a new valve plate in the position for the first operation. Thus, on the next rotation of 120°, the previous valve plate is drilled on its reverse side, and the new one receives the operations which have already been performed on the first one. The next 120° rotation of the work table completes further drilling operation.

The second time the original valve plate arrives at the loading position, all drilling operations on the top and bottom have been completed. There are still a number of holes to be drilled on the side; in the work table there is a fixture which holds the valve plate in the proper position so that on the third time around, the original valve plate can receive the necessary operations at the two working positions. The third time the valve plate arrives at the loading position it is ready to be removed from the machine.

In this machining operation, while three operations are being done simultaneously at two working positions (a total of six simultaneous operations, involving 44 holes), the operator is handling four castings. First, he is removing a finished valve plate; next he moves one in which top and bottom operations have been completed to the position for the side operation; then he moves one on which the top operations have been completed to the position where the bottom operations will be performed, and finally he places a new unmachined valve plate in the position to have the top operations performed. During this period of changing plates, the machine will have automatically completed the six operations, and will be ready for the next 120° rotation. The location of the holes drilled in this manner is very accurately guided by hardened steel bushings which are an integral part of the head.

Fig. 1 shows the head raised while the table is being rotated; Fig. 2 shows the head in working position in which all six operations, involving 44 holes, are being performed at one time.

A certain few holes in the casting require accurate cross location from other holes and are done in a subsequent operation. Fig. 3 shows the jig and machine of the drill press type used to do these final machining operations on the valve plate.

Tapping screw threads represents a difficulty in high production machines since, for small holes, the tap must be reversed in rotation to remove it from the hole. In larger holes a collapsing tap is used, which collapses inward after completing the threading operation and can be removed without reversing direction. For small holes, a high speed tapping machine is used, so designed that the operator runs the tap down into the previously drilled hole. On releasing the slight pressure required to force the tap downward, the spindle almost instantaneously reverses

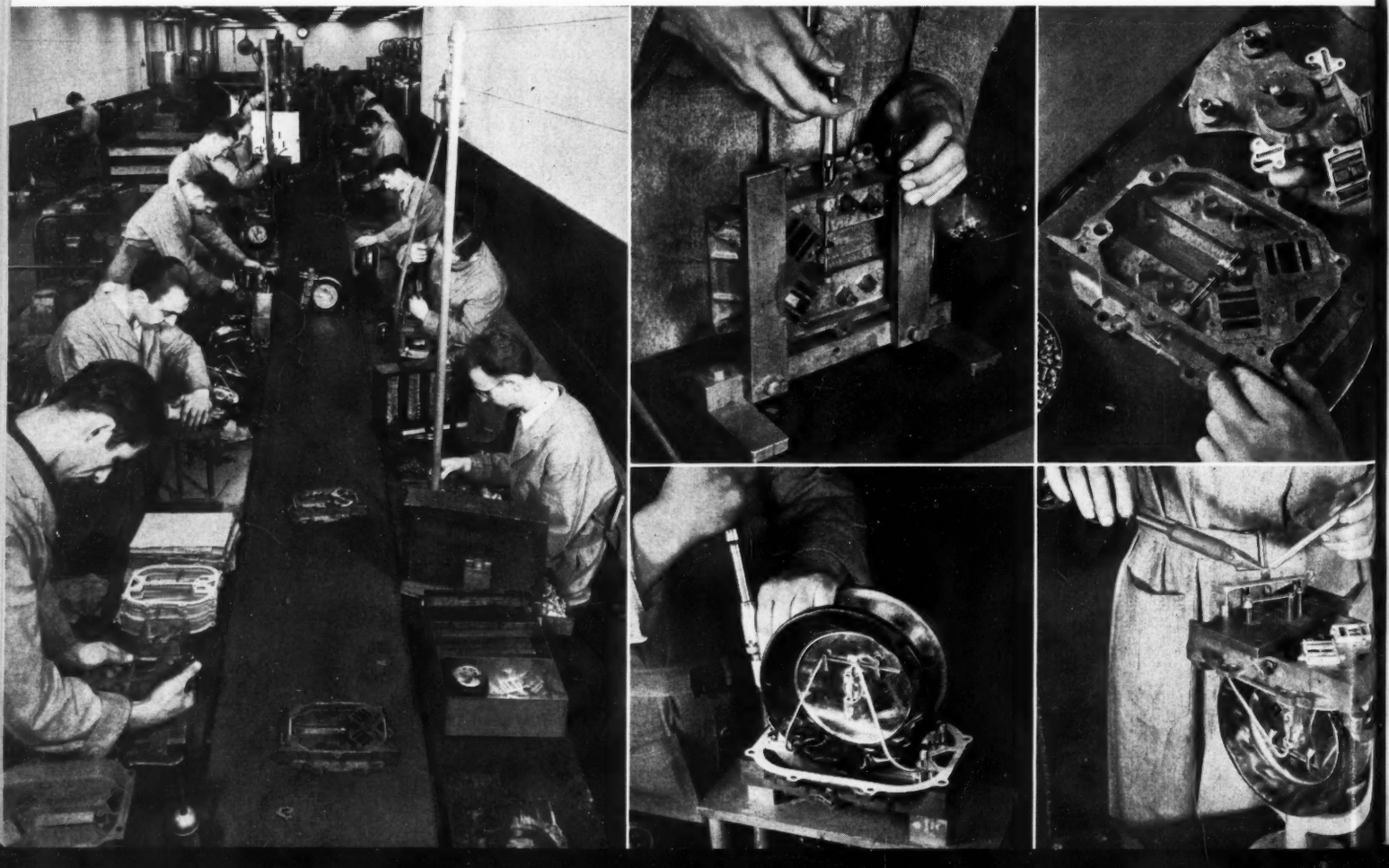
4. Overall view of Emco meter assembly line. Parts are stored in special trucks beside line. In center of picture may be seen moving belt which progresses to the far end of the room where proving operations are located.

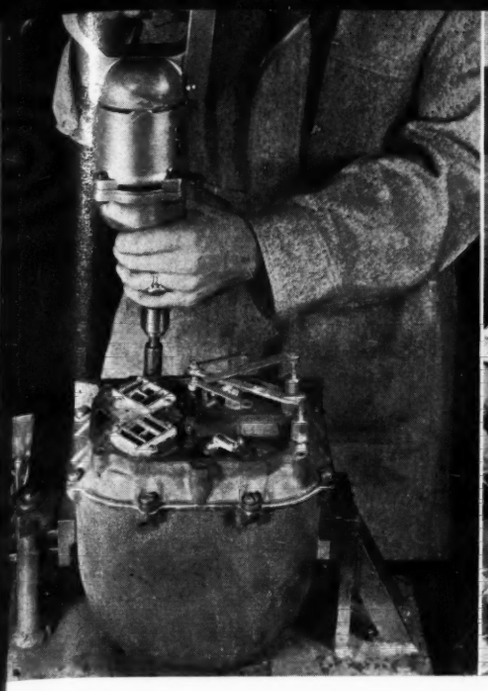
5. Upper center: Index shaft assembly. Sealing grease is squirted into position by gun.

6. Upper right: The operation of putting the valve seats and valve guides in place.

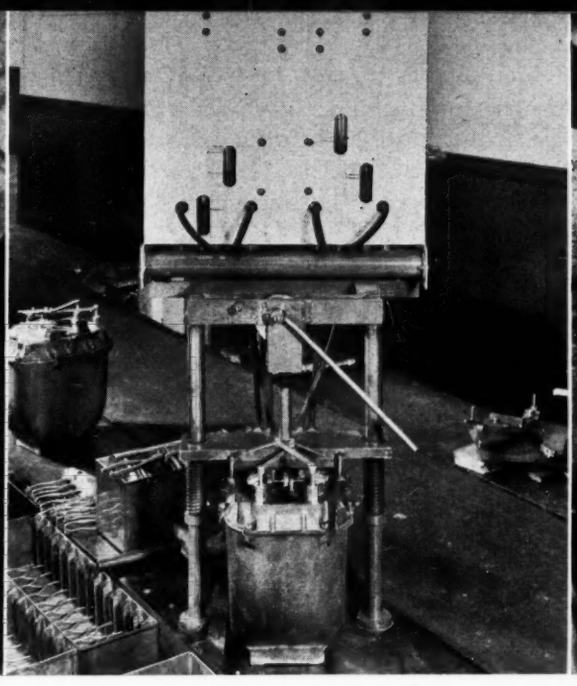
7. Lower center: Method of assembling diaphragm sub-assemblies to plate is shown.

8. Lower right: Jig which determines the angle between glag flag arm is shown.

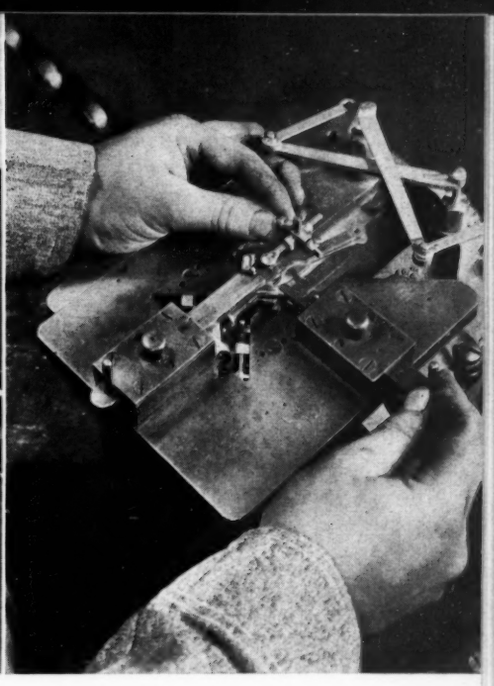




9. A power screw is used in placing the valve plate assembly into position.



10. This device is used to test four measuring compartments at the same time.



11. This valve crank jig has two movable arms which come in from 90° angles.

and the tap screws itself out. Twenty-five holes a minute can be tapped by this machine.

The other parts of the meter, both large and small, are produced by the same advanced methods as the valve plate described above.

In the assembly of the component parts into a working meter, it is of extreme importance that the proper location and inter-relation of parts be maintained. Unfortunately, it is possible to assemble a meter and have it pass proof test, yet the actual assembly be wrong; one error in location might correct another error. This is also true of meters repaired in a gas company meter repair shop. Under these conditions, the meter soon goes out of proof and wear occurs fairly soon. If the parts are assembled to a theoretically correct location, the accuracy in proof is maintained over a long period and wear will be very much delayed.

This precision in location and assembly can only be accomplished by locating jigs. With proper locating equipment, rapid assembly can be made to the exact proper location. This equipment also permits the use of a moving assembly line, in which each operation is timed exactly and the work progresses smoothly and accurately from the piles of component parts to a complete meter ready to go to the proving line. This smoothness and precision can be accomplished only by having all parts accurately fabricated, and all assembly operations carefully jigged and controlled.

An overall view of this assembly line is shown in Fig. 4. The parts are stored in special trucks beside the line, and as the assembly works downward, new parts are added, and arriving at the end, tests for leakage of the assembled meter are made.

The center strip in this picture is a moving belt, progressing at a predetermined rate toward the far end of the room where the proving operations are located. The valve plate starts out just as machined, and each succeeding operator along the belt removes the plate and assembles, by means of locating jigs, some part of the final meter. The plate is then put back on the belt and carried to the next operator.

The first operation shown in Fig. 5 is the assembly of the index drive shaft. First the sealing grease is squirted into position with a gun, and then, as shown in the photograph, a special wrench screws the retaining nut in position.

In Fig. 6 the operation of putting the valve seats and valve wire guides in place is shown. Fig. 6 also shows clearly the completely machined valve plate, revealing the precision necessary in the operations illustrated by Figs. 1 and 2. At the right of Fig. 6 we see a locating jig which holds the parts accurately in position. When this jig is reversed and placed on the casting to which the parts are to be screwed, the three projecting lugs shown in the picture will fit exactly into the flag holes and crank hole of the valve plate. Thus, when the parts are screwed down, they will be precisely located with respect to the flag rods and crank.

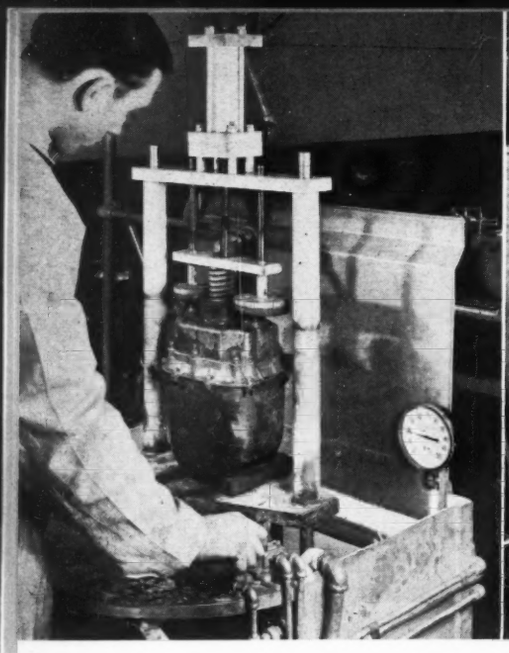
Fig. 7 illustrates the method of assembling the diaphragm sub-assemblies to the plate.

The important feature in Fig. 8 is the jig used to be certain that the angle between the flag and the flag arm is exactly right. The diaphragm is set at its extreme inward position; the flag link is positioned by means of two jig pins which hold the tangent link exactly in place. The jig which holds the two jig pins are located from two of the valve plate holes. With the parts thus held rigidly in place, the flag arms are sweated to the flag rods at precisely the correct position.

A power screw driver is shown in Fig. 9, putting the valve plate assembly into position in the meter body.

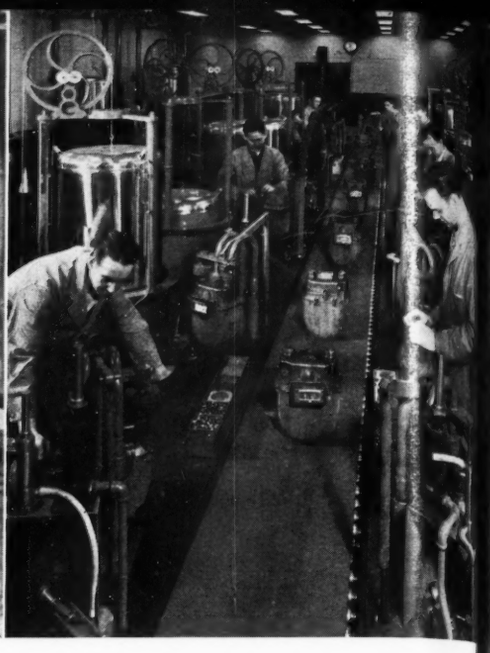
At this point the four required measuring compartments have been formed; two inside the diaphragms, and two outside the diaphragms but within the case. There must be no leak between these four compartments, and no leak from any compartment to the outside air. Fig. 10 illustrates a device for testing the four compartments at one time. The fixture, when clamped down on the valve seats, permits air to go into the inside of the diaphragms and extend them to their outer position. This movement forces air out of each outer compartment through a tube immersed in water. The pressure in the diaphragm is automatically controlled by a regulator and cut-off at a certain value when the diaphragm is fully extended. The pressure in the two outer compartments is controlled by the distance the seal tubes are immersed in the water. With the air supply locked in, each compartment will register on its water column the pressure in that compartment. Any leak will be detected by a fall in the water column. All adjacent compartments have a difference in pressure, so internal leaks as well as external leaks can be detected.

The crank mechanism is next to be added to the assembly. The lower bearing of the crank has been drilled in the valve plate through an accurate drill jig in the first operation and therefore must be accurate. The top bearing, held in place by screws, should also be correctly positioned, so the jig shown in Fig. 11 is used. This jig is located from the flange holes of the valve plate, and has two movable locating arms coming



12. After the valve assembly is completed, the meter is given a leak test.

13. During the proving operation, crank is changed from check to open flow rate.



14. View of the proving section showing unproved meters on the moving belt.

in from 90° directions. With these two arms in their forward position, the yokes at the arm end locate the crank top in its proper position. The crank is retained in this position while the screws are tightened down.

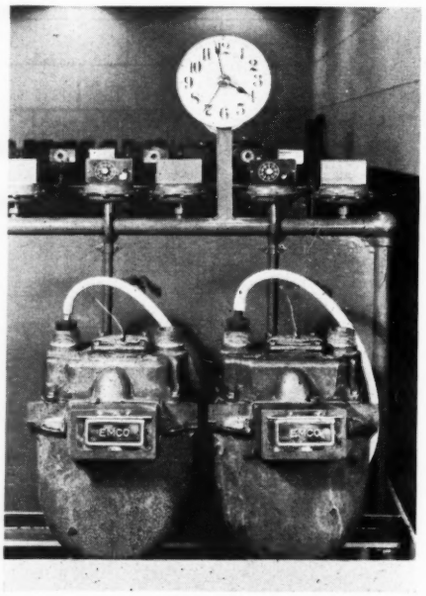
After the valves are assembled and the top cover screwed down, the meter is given a leak test as shown in Fig. 12. Rubber pads, actuated by an air cylinder, clamp all external holes. Ten pounds is then applied to the meter, and a second air cylinder lowers the meter into water for the immersion test.

The index and index box are now placed on the meter and it is ready to progress to the proving operation.

In the matter of proving, there are many technical points which affect meter accuracy and performance. The proving operation is essentially that of taking an accurate and true cubic foot of displaced air, as shown by the proving bell, and forcing it through the meter. If the meter is correctly made and accurately adjusted, the meter index should read exactly 1 cu. ft. To be certain that there is no change in the true cubic foot volume, there should be no change in the temperature of the air in passing from the prover bell on through the meter. If a prover room is subject to changing temperatures, for instance, following the normal changes in atmospheric temperature, the air in the room, the air in the bell, the prover seal oil, and the actual meter will change in temperature, too, but at a different rate. The meter being mainly of metal will lag far behind the air in changing temperature. The oil in the bell seal will also be slower than the air. The air trapped at any one time in the bell will change at a rate somewhat between that of the atmospheric air and the oil. Hence, where changing temperatures exist, it is very difficult to keep the transfer of a cubic foot from the bell through the meter at the same temperature.

The obvious answer to this problem of changing temperature is to air-condition the air so that there is no change. Then if the meters, or the meter parts during assembly are left in this controlled temperature long enough, they will arrive at this temperature and then not change. To accomplish this, in building the Emco meter, the assembly and proving operations are done in the same air-conditioned room. Hence when the assembled meter arrives at the prover, air, oil, and meter are at this same temperature, and none of the elements involved will be subject to any change in temperature.

Humidity, affecting air volume, is a minor factor, and can be eliminated, too, if the relative humidity of the air is also controlled. The air in the Emco proving room is controlled for moisture content as well as temperature.



15. This apparatus is used to give meters a slow light and differential pressure test.

The proving operations are speeded up by using special air pressure actuated clamps to hold the meter in place, and to make the necessary inlet and outlet connections. Merely turning the air cylinder lever makes the required connection. As is usual, two flow rates are used in proving, one at the capacity flow (or open flow for some customers) and one at the check flow. The detail of this prover connection is shown in Fig. 13. A crank is turned to change from the check flow rate to open flow rate.

To facilitate handling, a moving belt is also provided for the meters after proof, so that they can be readily transported to the location where a differential pressure test and a low flow test is made. A view of the proving section and the moving belt is shown in Fig. 14. The meters on the belt not having the top cover in place, have not at this point been proved. They will be removed by one of the prover operators. After proving, the top cap is screwed into position, the meter is placed back on the conveyor belt and progresses down the line.

Meter accuracy at low flows is now-a-days very essential, due to the increasing use of pilot lights in ranges and heating equipment and the rapidly growing popularity of gas-fired refrigerators. In many instances a substantial portion of the gas load is served at rates of 1 cu. ft. per hour or less. Hence, meters should be capable of accurate measurement at these rates. A test to insure the meter operating at this low rate (½ ft. per hour) is performed on all meters.

Meters are removed from the con-

veyor belt which brings them from the proving section, and are placed on a specially constructed bench. Here the inlet is connected to a source of air which feeds through an orifice at the rate of ½ cu. ft. per hour. The detail of the test is shown in Fig. 15. When the meter is connected to the air supply, the index wheel above the meter is set to correspond with the position of the ½-ft. index hand on the meter. The clock shown is merely a face with movable hands, and these hands are set at the time the meters are connected. (The advance shown by the hand indicates the time required to pass ½ cu. ft.) When the actual time corresponds with the advance reading of the set clock, the indexes of the meters are inspected to see that they have rotated the proper distance to insure the meter operation at these low rates. A large number of meters can in this way be low-lighted by one man.

Another important test which should be performed on all meters, new or repaired, is a differential pressure test. This test measures the actual loss in pressure across the meter at a given flow rate. If a good differential pressure measuring gage, such as a slope gage, is connected properly across a meter, the pressure loss as the meter operates can be read. Actually, as the meter operates, due to the four compartments being alternately opened and closed, there is some variation in pressure. If this variation is great, one of the "swings" of the gage will be high and this unevenness may be easily noted. This usually results from improper valve timing. Also, if the pressure loss is generally high, due to mechanical binds or stiff diaphragms, it will read high on the slope gage. In some manufacturing and repair shops, a slope gage is provided to check this differential pressure and a maximum is set, above which it must not go. Watching the test gage on a large number of meters is a formidable task, so the test shown in Fig. 15 is provided with a device which automatically records if the differential pressure exceeds a certain amount. In place of a slope gage to be continuously observed, a sensitive diaphragm is used weighted to just the maximum allowable differential pressure. If during the low flow test this differential is exceeded, the diaphragm is raised and a signal appears just to the right of the dial on the fixed index at the top of the bench. In this way both the low flow test and differential pressure test are given at the same time, assuring both properly-built meters and meters which register on low flows.

After the completion of this test the meter is now ready to be transported to the paint spray booth and then on to the shipping department.

Fig. 16 is a general view of the assembly, proving and testing department. As explained above, the entire room is air-conditioned for both temperature and humidity. All parts coming to this room are built on very accurate equipment and checked on precision gages. During the assembly operation, jigs and fixtures are used which guarantee every accurate alignment and location of parts. Proving operations are quick and accurate and additional low flow and differential pressure tests are given which insure the quality of the product.

This description of a high production plant should be of some interest to the industry which uses these meters. An important fact which is not always apparent to the uninitiated is that production methods such as described, while increasing production rate, have the much more important feature of increasing accuracy and precision. Rigid tools, jigs, dies, gages and fixtures assure uniformity and precision that results in not only a more accurate meter, but one which, being properly assembled and balanced, will give service through a long active measuring life.

16. General view of assembly showing proving and testing departments. Entire room is air-conditioned for temperature and humidity. All parts coming to this room are built on very accurate equipment and checked on precision gages. During the assembly operation, jigs and fixtures are used which guarantee every accurate alignment and location of parts. Rigid tools, jigs, dies, gages and fixtures assure uniformity and precision. Proving operations are quick and accurate. Low flow and differential pressure tests insure the quality of the product.

SALES Slants

Demonstration is the Thing!

IN Pittsburgh a thriving department-store cooking-school attracting about 50,000 persons annually centers about a modern all-gas kitchen. Members of about 500 organizations attend the school in large groups, then during the afternoon shop in the department store.

The enterprise began six years ago when The Rosenbaum Co. invited Mrs. Sarah E. Tomlinson, home economist, to its department store. Today Mrs. Tomlinson's territory includes a 60-mile radius; her cooking schools seats 260 people daily at more than 50 tables with service supplied by 10 persons; and her school program is booked one full year in advance.

A practical idea brings women's groups to the school. "If you are a married woman and belong to an organization," Mrs. Tomlinson explains, "you need to make money. Organizations have learned that often after working hard sponsoring a dinner they have cleared but $15. With the cooking school," says Mrs. Tomlinson, "we provide the food and do the hard work for them, and they have only to sell tickets. Together with the entertainment held in the studio by each organization after the cooking school session the organization often clears $100."

The cooking school differs from others in not being open to the general public. Members of the various organizations sell tickets at their club meetings; not at the door of the cooking school, although the school keeps close tab on the number of tickets sold. No tickets sell under 40 cents, and sometimes organizations charge 75 cents a person.

Guests arrive at 12:30 for luncheon in the Home Arts Studio on Rosenbaum's seventh floor. The 40x80-ft. cooking school section has the atmosphere of a country club or hotel. Guests dine on Fiesta Ware set on tables standing in vertical rows.

The day's sole demonstration begins at 1:30 when guests face an elevated platform and the "Modern All-Gas Kitchen" installed and designed by Pittsburgh's A. D. Schrader & Co. The kitchen, with cream walls constructed of veos tile, sports red curtains, stainless-steel sink, art-metal cabinets and range and refrigerator of steel construction which stand on black linoleum. During the year eight of the 2[illegible] gas ranges on the market carrying the CP standard of approval, appear on the platform.

Demonstration is the thing! Instead of presenting a "straight" program with the demonstrator holding up products and talking about them, Mrs. Tomlinson holds a "regular" cooking school. Her success, she believes, results from talking to the housewives in their own language and really becoming interested in their cooking problems in general. Secondly, she has persuaded manufacturers, interested in the exclusive presentation of their own product, to permit demonstrations of 15 products. "Why should one confine the work to just one food product," says Mrs. Tomlinson, "when we can advertise many and do just as good a job for our manufacturers?"

During the demonstrations Mrs. Tomlinson bakes several varieties of rolls and cakes, broils steaks, makes desserts, shows the merits of good refrigeration in storing foods.

Following the effective demonstrations, to obtain printed information to supplement the one folder placed each day at guests' tables, persons walk to a literature table near the lecture platform. "If one leaves literature too handy," Miss Tomlinson explains, "people will walk away without it; while they prize it if they must walk across to the literature table to 'earn' it. Secondly, we must create sufficient interest in our products that persons will want to walk to the table. And thirdly, if they really have no desire for the literature, our method prevents considerable waste."

At 2:30 p. m. the cooking school turns over the auditorium to its guests for entertainment. Bridge playing proves most popular, followed by musicals. We might entertain many different types of groups daily, says Mrs. Tomlinson, but eventually this would mean both a repetition for women members of the same family and extra expense for elevator service and watchmen; so we do not entertain evening parties. Publicizing the cooking school, Mrs. Tomlinson has a booth at Pittsburgh's great annual Allegheny County Fair, and a radio broadcast sponsored by a packing company acclaims the school far and wide.

The youngsters line up for an after-school snack under the watchful eye of Mrs. Tomlinson, popular Pittsburgh home economics demonstrator. An assistant in white uniform demonstrates at the gas range.

■ ■

Natural Gas Office is Opened In Lake Crystal, Minnesota

The Minnesota Valley Natural Gas Co., with headquarters in St. Peter, Minn., has opened an office in Lake Crystal, Minn. The company occupies one-half of the Nelson building and carries a complete line of modern gas appliances—ranges, water heaters, refrigerators and heating appliances.

"A Happy Home," played by Helen Joseph's puppets and sponsored by the Consumers Power Co., shows the domestic happiness brought about by the installation of a modern water heater.

Puppet Show Portrays Merits of Water Heater

AS a means of emphasizing the contribution which a good water heater makes to domestic happiness, the puppet show, "A Happy Home," presented by Duane Harmon, of Helen Joseph's Puppets, Cleveland, Ohio, and sponsored by the Consumers Power Co., Jackson, Mich., is touring several of the company's principal retail stores throughout the state. In the last six months it has been presented in Pontiac, Flint, Saginaw, Bay City, Alma, Lansing, Hastings, Jackson and Kalamazoo.

In "A Happy Home," five different voices are heard, including those of men, women and a baby. But they all emanate from Mr. Harmon, who stands unseen behind a velvet drape while the puppets, manipulated by his skillful fingers, perform on the stage above him.

"A Happy Home" portrays early morning discord in a home without hot water, then the happiness attendant upon installation of a modern water heater. A special setting permits an instantaneous change of scene from the kitchen to the basement and back again.

An outstanding figure in the puppeteering phase of show-business, Duane Harmon has given several thousand performances since he chose this special field of theatrical art 15 years ago.

■ ■

Payne Dealers Are Offered Automatic Ad-Man Service

Payne Furnace & Supply Co., Inc., now offers a service of particular value to the dealer who has no advertising department of his own in the form of the "Payne Automatic Ad-Man" mat service. The Automatic Ad-Man folder contains several ads in sizes of 1 col. by 6 in., 2 col. by 6 in., and 3 col. by 12 in. Ideas for ads including layout suggestions, headline suggestions and theme of copy suggestions are also offered in the service. All ads pictured can be ordered from the company by code number and additional copies of the mat service may be secured from R. V. Hiatt, Advertising Manager, Payne Furnace & Supply Co., Inc., 336 North Foothill Road, Beverly Hills, Calif.

Make a Friend and Make a Sale

WE know of only one man in the world who can get another person to do something by simply demanding it of him. He is a highwayman! And his life is precarious. Moreover, he is bound to fail eventually.

The only known method that works consistently of getting people to do something is to make them *want* to do it.

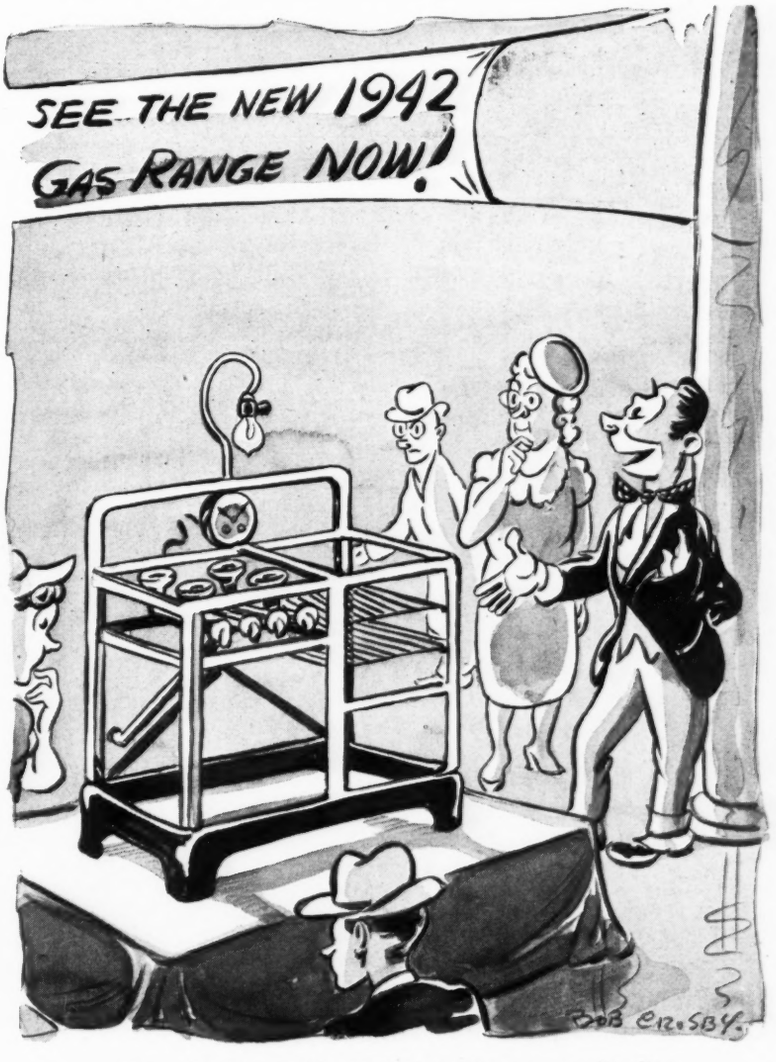
As a salesman, you get business by talking advantages — personal gain, quality, service, performance. By this method, you make the housewife want to give you the order because you have convinced her that nowhere else can she get exactly what you offer or so much of it. Too, you have probably created in her the desire to want to favor you and please you.

But under no circumstances will you get an order from one who happens to dislike you. The buyer can be indifferent to you and you can still get business on the merits of your product, but if she grows to dislike you for any reason, it's fatal.

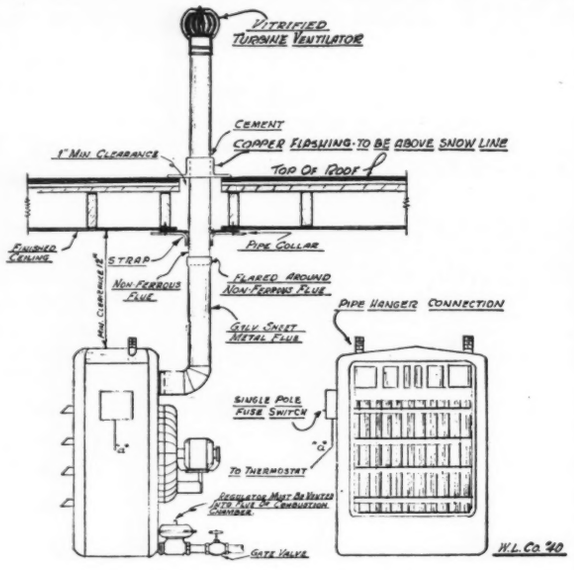
These truths are not new but they are being preached today by the sages of selling as never before. And perhaps they explain why some men who make their living selling can own their own homes, drive fine automobiles, send their children to college and join all the local clubs, when the other fellow who works even harder finds it difficult to make ends meet.

Yes! they have become masters of the art of causing people to like them, or at least of avoiding their dislike.

DOTTED LINE ROSCOE . . . . . By Bob Crosby



"It's called our 'Priorities for Defense' number!"



Venting: All venting must be strictly in accordance with National Board of Fire Underwriters requirements, and also so as to conform to Local regulations. Each unit should be vented to a proper chimney. Where masonry chimney is not available, each unit should be supplied with a separate vertical vent to the outside. *Care should be taken that flue is not trapped.* Vents should be constructed of transite or other nonferrous pipe and should be capped with a Rotary Turbine Ventilator. Pipe flues should be carried at least 4" below the finished ceiling where the breaching from the heater (heavy galvanized iron) *should be flared around the outside of the flue pipe and fastened with Parker screws.* On multiple units use header which can be connected to main chimney or flue. Where flue passes through combustible material, proper insulation must be furnished.

Electrical Work: All electrical work should be done in accordance with National and local requirements. Mount on side of each heater a Square D Type single pole fused switch. The accompanying drawing should be carefully followed when possible.

FIG. 1

Suggested installation for gas-fired unit heater flues.

Gas Heats a New Roller Rink

By J. E. COOK

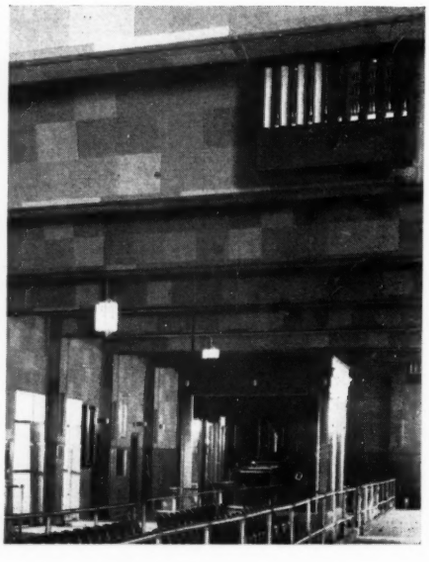
Manager, Architects and Builders Division, Westchester Lighting Co., Mount Vernon, N. Y.

ROLLER skating and gas heating are alike in that both have been growing in popular favor these days. It is not surprising therefore that the two should come together as they have in the new White Plains Roller Rink at 80 South Kensico Ave., White Plains, New York.

This new rink is evidently an all-around example of knowing what the public wants. Originally an ice-skating rink, it was converted into a roller rink by its new owners, who operate a chain of roller rinks. Architect James Holt, specialist in amusement work, was engaged to plan the desired alterations, which were completed at a cost of approximately $35,000. The gas heating equipment and service requirements were supplied by Westchester Lighting Co., Mount Vernon, N. Y.

Overall dimensions of the rink are 197 ft. by 130 ft., with an average ceiling height of 17 ft. The gas heating equipment includes five No. 2-A-85-C Bryant Unit Heaters and two No. 2-D-85-C Bryant Duct Heaters, and has a total input of 1,190,000 B.t.u. per hour. A small, oil-fired, steam heating plant had been used to spot heat the grandstand, but this was removed because it was inadequate, and gas was substituted. Gas consumption, for heating only, is estimated at 2,178,000 cu. ft. during a seven-month heating season, using 540 B.t.u. manufactured gas.

In his role of amusement specialist, Architect Holt has had very excellent results from this type of installation. Westchester Lighting together with the manufacturer worked out all heating details and negotiations through the architect, as his clients had placed him in complete control of the project. It is apparent that this procedure worked well for the satisfaction of all concerned. A critical eye may note that the Unit Heaters were located somewhat higher than might be expected. This was done at the architect's insistence, in order that they might be less conspicuous and fit more harmoniously into his general design.



View of unit heater installation in upper right corner.

Gas Refrigeration Is Choice For Public Housing Projects

That the United States Housing Authorities are showing a strong preference for Servel Electrolux gas refrigerators is indicated by the installation of more than 13,000 gas refrigerators for 38 different government housing projects during the first three months of this year.

The projects are located in 24 cities in 14 states, including Tennessee, Kentucky, Oklahoma, California, Massachusetts, Texas, Montana, Illinois, Rhode Island, Arkansas and Pennsylvania.

Installations have recently been made for the following projects: Fort Lauderdale (Fla.), 150 gas refrigerators; St. Petersburg (Fla.), housing project for negro families, 243 gas refrigerators; Littlepage Terrace, Charleston, (W. Va.), housing project, 171 gas refrigerators; Washington Manor housing project, Charleston, (W. Va.), 302 gas refrigerators; La Armada project at Corpus Christi, Texas, 250 gas refrigerators, and Elyton Village project, Birmingham, Ala., 863 gas refrigerators.

Harper-Wyman Co. Issues Booklet for Range Salesmen

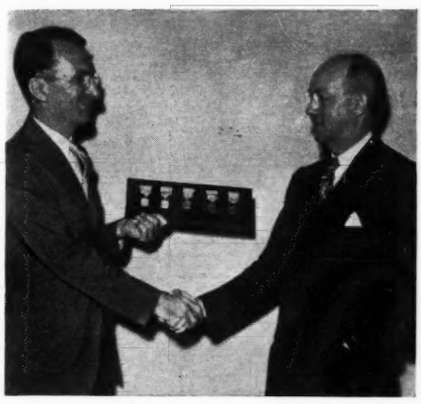
A new 48-page handbook for gas utility salesmen, entitled "How to Sell More Gas Ranges" is being distributed on request by the Harper-Wyman Co., 8562 Vincennes Ave., Chicago, Ill., makers of the Harper Burner System.

Twelve floor demonstrations which are pointed to give customers visual proof of the merits of the modern gas range are a feature of the pocket-size handbook. The demonstrations can be performed on any sales floor and require no expensive equipment other than a connected modern range.

Salesmen are given instructions on how to demonstrate such features as "keep warm" heat, "absent cooking," vitamin preservation in foods and cooking without wasted fuel. A series of "selling sentences," designed to help the salesman put over his selling points verbally, accompany each demonstration.

Minnesota Natural Gas Co. Opens Offices in Lakefield

The Minnesota Natural Gas Co., with main offices in Worthington, Minn., has opened an office in Lakefield, Minn. William J. Miller is manager. Work on the natural gas distribution in Lakefield has already begun following a survey which was made to determine the number of homes desiring natural gas.



Messrs. Heimbach and Loomis

Michigan Consolidated Displays Win Five Awards

In a national contest which was a feature of the annual convention of the International Association of Display Men held at Chicago recently, Roy Heimbach, superintendent of displays for the Michigan Consolidated Gas Co., Detroit, Mich., received a total of five awards in the Utility Division. His honors included two gold first awards, one silver second, and two bronze thirds.

The displays which won these honors for Mr. Heimbach were windows and interior displays for sales floors and special exhibits.

Mr. Heimbach, who has been with the company 17 years, is shown shaking hands with Newell E. Loomis, sales manager of the Michigan Consolidated Gas Co.

■ ■

North Shore Gas Co. Stresses Value of the Master Plumber

In its recent campaign for better cooperation between consumer, plumber, and gas company, the North Shore Gas Co., with main offices in Highland Park, Ill., went further than merely listing the region's master plumbers in newspaper ads and suggesting that they be consulted.

An entire program, prepared by Bozell & Jacobs, Inc., Chicago, emphasized the importance of the plumber and the gas company working together for mutual benefit as well as the benefit of the consumer.

The gas company periodically holds get-togethers with plumbers of the community, which are primarily social gatherings, but which nevertheless often develop into discussions of business problems and iron out numerous difficulties. These social and educational meetings, over a period of years, have been found to develop the kind of cooperation which results in a substantial increase in business for the gas company and a general feeling of good-will among all parties concerned, including the consumer.

■ ■

F.P.C. Authorizes Price Cut By Washington Gas Light Co.

The Federal Power Commission has announced the issuance of an order authorizing a reduction in the price of natural gas sold by the Washington Gas Light Co. to the Washington Gas Light Co. of Montgomery County, Md., from 45.1¢ per M.c.f. to 43.0¢ per M.c.f. subject to adjustment for changes in taxes and operating expenses. The new rate, which is effective as of July 10, 1941, is three cents higher than the rate charged by Washington Gas Light Co. for the sale of gas to Rosslyn Gas Co.

Final Results of CP Ranger Contest

FINAL results recently released of the CP Ranger Club contest show California Rangers leading the nation by capturing all 20 prizes in Division I of the three-month cumulative contest. These outstanding achievements were especially gratifying to the participating merchants and the utilities which sponsored the contest.

Now in its third year, the CP Ranger Club, which is one of the country's leading sales fraternities, is sponsored by the American Gas Association to provide national recognition for outstanding sales achievements by gas company salesmen, dealers and dealers' salesmen in the sale of Certified Performance Gas Ranges. The California contestants were in competition with the range salesmen in New York, Boston, Chicago and Philadelphia.

All cash prizes were donated by the CP range manufacturers of the Association of Gas Appliance and Equipment Manufacturers. Dealers and their salesmen became eligible to compete in the contest upon payment of the entrance fee by the utility company serving the area in which the dealer was located. Awards were determined by the officers of the CP Ranger Club, based on reports from the various local Ranger Club representatives.

One of the interesting results of the contest was the fact that with only one exception, nowhere in the nation except in California were prizes won by dealer salesmen. In California every prize winner was a dealer salesman.

Emma Gonzales, San Francisco's first CP Rangerette, receives congratulations from P.C.G.A.'s Managing Director, Clifford Johnstone, for her seventh prize in the CP Ranger Cumulative Contest.

In the northern and central California territory, served by the Pacific Gas and Electric Co., these salesmen won eight prizes in March, six prizes in April, and four prizes in May (out of a total of eight prizes awarded each month), and 11 prizes for the cumulative three-month period, including the first prize each time.

Suitable recognition was given these prize winners by a series of breakfast meetings held in their honor by local gas appliance society groups in San Francisco, Oakland and San Jose.

Boy Scouts of Troop 147 are shown at the home of their scoutmaster, Dr. Jerome Dulberg, 408 Avenue O, Brooklyn, N. Y., with the pile of aluminum collected in house-to-house canvassing and ready to be loaded in one of the trucks loaned to the drive by The Brooklyn Union Gas Co.

Pittsburgh's Gas Appliance Campaign

GAS Appliance Promotion Division announces plans to stage during October the largest gas range campaign ever promoted for the natural gas companies serving the greater Pittsburgh area, to aid more than 550 cooperating furniture, hardware, appliance and department stores handling gas ranges.

Campaign will use full-color window display sets, free gifts for customers, a full schedule of newspaper advertising, and prizes for salesmen. Display material, to be supplied free to each dealer, will make use of full-color food reproductions showing top range cooking, oven baking, and high-speed broiling, and will include 14 pieces: large main window banner, streamer, nine window spots, and three easel-backed display cards for use on ranges either in window or in store displays.

Each dealer who advertises will receive also a supply of a useful kitchen device known as a "Gas Broil-O-Guide" to be given to people who visit their stores in response to advertising done by them either in circulars or newspapers. Salesmen competing in a contest during the entire 1941 October campaign will win points for each gas range sold, with points accredited according to a sliding scale of gas range prices. Points awarded each salesman will earn for him valuable prizes selected from a wide choice of all types of merchandise as shown in attractive sample books supplied free to each dealer.

This gas range sales campaign follows two unusually successful promotions conducted last spring. Figures released recently for the May, 1941, Servel Electrolux gas refrigerator campaign, sponsored by the Gas Appliance Promotion Division, show that 160 independent retail dealers sold 1023 units at an average price of $194.66. During the 1941 April gas range campaign 549 dealers in 105 towns served by the division sold 5913 gas ranges, an increase of approximately 14% over the 1940 April gas range campaign (campaign held twice yearly in April and October). Average gross price of $93.85 per range represents an increase of $5.55 over the $88.30 average during April, 1940, an average which would have run higher if manufacturers could have made deliveries of all models.

Sale of CP ranges during April, 1941, totaled 499; average gross price, $125.70, an increase of $6.68 over the October, 1940, campaign. Gas Appliance Promotion Division material went into window and store displays of 408 dealers. To promote sales of 36 models of gas ranges, 177 dealers paid approximately $12,687 for 10,768 column inches of newspaper advertising, which supplemented expenditure by gas companies for individual and cooperative advertising. Some 66 community newspapers which carried advertising, exclusive of Pittsburgh papers, covered a population of 2,312,361.

Employees of the gas division of the Colorado Public Service Co., Denver, Colo., were dressed as cowgirls and cowhands during the International Rotarian Convention held there recently. The novel "Round-up" group which staged the show for the company is pictured above. Features of the program included a cowboy band, distribution of souvenirs of leather desk pads branded cowboy-style with the name of the firm and the Rotarian cogwheel, and a "chuck wagon" lunch. This unusual promotion drew the largest crowd ever to visit the utility showrooms.

Musical Sales Skit Offers Novel Demonstration

ONE of the most novel home demonstrations developed in the last year is the "sales skit set to music" type of demonstration which has been used on several occasions at various gas industry meetings. Credit for the development and first presentation of this form of musical drama goes to Mrs. Marguerite Scroggie, home service director of the Southern Counties Gas Co., Santa Monica, Calif., who gave her lyrical "Gasconcade" at the Pacific Coast Gas Association meeting in Coronado, Calif., last fall.

The idea of setting the skit to music came as an after-thought to Mrs. Scroggie, following her decision to present her demonstration dramatically in the form of a skit.

With the assistance of Mrs. Frances Brewer and Miss Joy McCambridge, of the home service department, three characters to illustrate different cooking methods were originated. The cast was composed of Mrs. Brewer as Rita of the Range, Miss McCambridge as Baking Belinda, and Mrs. Scroggie as Broiling Betty. Douglas Ross was in charge of stage direction, and Howard Everett set the skit to music.

"The most difficult problem encountered in the presentation was the complete synchronization of verses, cooking times, action and music," said Mrs. Scroggie. "This necessitated the serious use of several watches with good second hands and even then lines had to be added, or speeded, or the music altered in order to achieve the right effect," she added.

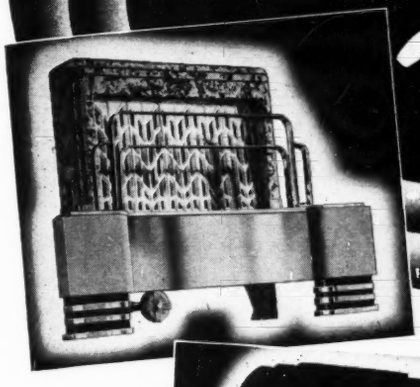
Competition Runs Close in Water Heater Sales Contest

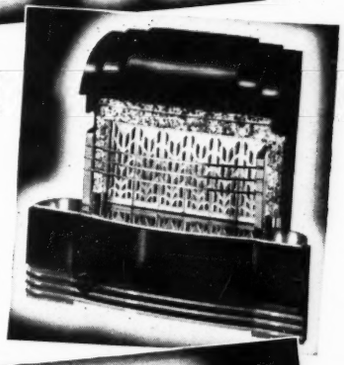
Competition has been keen this year amongst plumbing and heating engineers in connection with the Gas Sales Contest conducted by the British Columbia Electric Railway Co., Vancouver, B. C. Under this contest, the salesman of the firm with the largest number of water heater sales is awarded a free vacation trip. At present there is a tie for first place in the list between Kirkland's Metal Shop and Henry Wilson. While the second place of the list is tied by D. Collie, A. L. Dixon, R. B. Gaskarth, George Muir, A. W. Barber, and The Workshop.

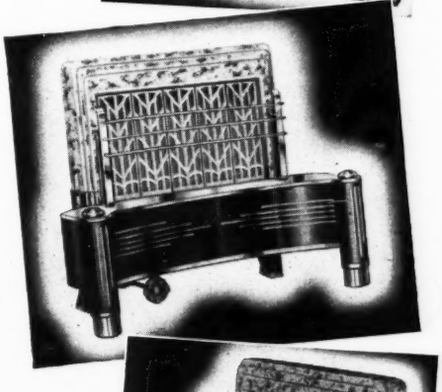
La Jolla, Calif., Gas Office Is Moved to New Location

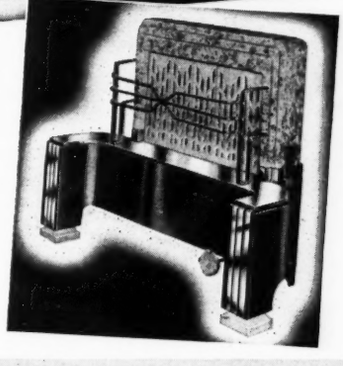
The La Jolla, Calif., office of the San Diego Gas & Electric Co. was moved into its new offices at 7851 Girard Avenue on July 1. The new quarters are equipped with a modern lighting system and the latest in gas heating and ventilating. W. J. Gilmour is local manager of the company.

Highlight YOUR FALL SALES DRIVE with these BRILLIANT HUMPHREY Radiantfires









THE times are right for a lightning sales drive on Radiantfires this Fall.

Bulkier pocketbooks are encouraging thousands on your lines to buy the things that will make their homes more comfortable. The first chill of Fall will turn their thoughts to adequate heat for the cold months ahead.

The times are right, too, because never before have you been able to offer your customers such distinctive styling as in the 1941-42 Radiantfires — and such a range in sizes and prices.

The popular 400 series has been enlarged. It now includes brilliant designs in both vented and unvented models — efficient in operation to encourage frequent use, and durably constructed to assure years of heating satisfaction.

Mark your calendar now for an all-out drive on Radiantfires this Fall. Send for our latest Sales Helps Portfolio to help you with your plans.

GENERAL GAS LIGHT COMPANY
KALAMAZOO, MICHIGAN
23 Warren St., NEW YORK CITY 2nd Unit Santa Fe Bldg., DALLAS 475 Eleventh St., SAN FRANCISCO

Natural Gas Aids Defense in Missouri

By BERT R. MERRILL

STILL another step in the burgeoning role of natural gas for national defense manufacturing and production of essential armament and munitions for "our new army" is the recent conversion of the glass-melting and production plant of the Mississippi Glass Co. of St. Louis, Missouri, from the use of producer gas made in an independently-owned plant to natural gas supplied by Mississippi River Fuel Co. of St. Louis.

Mississippi Glass Co., largest gas-using firm in the state, is at present utilizing between 1½ and 12 MMc.f. of natural gas per day for the production of a new type of building glass which has heat-ray elimination properties. Chemically treated, the new type of plate, which has been manufactured only since the inception of the national defense program, shuts out infra-red rays which cause heat in large buildings, and thus is playing a vital part in the construction of airplane hangars, Army munition plants, armament manufacturing buildings, and even in defense camp buildings.

Producer Gas Had Drawbacks

Some of the outstanding installations which have been made by this middlewestern glass plant, according to Ellis Humphries, treasurer of the company, included the Vultee plane factory in Downey, Calif., the huge new tank factory constructed by Chrysler Motors in Detroit, Consolidated Aircraft construction buildings and bomber hangars at San Diego on the west coast, Curtiss-Wright plant at St. Louis, and the Glenn Martin bomber plant. Others completed are the Wright Aeronautical Manufacturing Co., Douglas bomber plant being operated by the government, and most important, the eastern plant of Pratt & Whitney, plane motor manufacturers for both Army and Navy. In each of these, the use of the specially-treated glass has enabled the plants to step up production through better working conditions, better light, and protection from heat in the summer months.

Formerly, the Mississippi Glass Co. manufactured its own producer gas in a producer plant located a block and one-half from the glass melting and treating building because of its bad odors. To produce gas in sufficient quantities to operate the huge regenerative furnaces which turn out 125 tons per day of melted glass, one ton of soft coal per ton of glass produced was consumed, averaging 125 tons per day, or "ton for ton" on the regulation production schedule. Although this independently operated gas system had been used for many years, it had many drawbacks in the form of haulage costs for coal, difficulty of storing such huge quantities, high cost for tons of glass produced, and bad odor conditions around the entire location. In addition, because of the invariably dirty condition of the producer gas piped hot to the regenerative furnaces (this passed through a 3-ft. brick-lined pipe from producer to the furnace), soot and other accumulations forced Mississippi Glass Co. to halt operations once a week while the pipe was burned out clean. This process required from four to six hours per week, and with the pressure of defense orders pouring in, made a serious gap in the amount of hangar glass produced.

In August of 1940 the plant management made plans for conversion to natural gas, made possible by piping a line of 4-in. diameter with 30-lb. metering pressure from the regular industrial mains of Mississippi River Fuel Co. directly up the furnace itself. Since that time, only natural gas has been utilized, and the producer plant is inactive. Results, according to Mr. Humphries, are much more economical operation, stepped-up production, and a far better rate of perfect glass per ton produced by the furnaces.

The factory is laid out in progressive production lines, with a huge furnace whose production rate is 100 tons of original glass, with a 25% "remelt" of glass scraps and leftovers, or 125 tons in all. The regenerative furnace measures 25¼x53 ft. inside dimensions, with a refining chamber of 22x19 ft. A mixture of gas and air from regenerative chambers on each side is passed through a "bottleneck" aperture 3 ft. wide and 1½ ft. high, with low pressure at this nozzle from a natural draft system. Passed alternately over the molten glass from "doghouse" regenerative chambers on each side (30 ft. high, providing a stack draft effect) the flame combustion is in alternative cycles — one chamber providing heated air and gas each 30 minutes of production, by means of heat-retaining regenerative brick honeycombs. Switching of one to another is entirely automatic by a gas checker and temperatures of 2400° or 2500° F. are produced, with 2900° easily possible.

It is interesting to note that interior construction of the furnace includes a silica brick arch over the molten glass, and "flux brick" tank linings which slowly melt away into the glass without changing its molecular character. To obviate burning through, a powerful air blower circulates 17,000 c.f.m. around the outside of the flux brick, to cool it where red spots indicated burning through. Glass is removed for rolling into plate from the refining chamber by three ports, either by passing over rollers, or dipped out in ladles.

Economy Benefits Are Found

Chief economy benefits are found in better combustion of natural gas as brought in through the combustion chambers, and lower amounts. Average gas usage is from 8000 to 10,000 cu. ft. per ton of glass, with 51,000 cu. ft. per hour used when the furnace is operating at maximum capacity. Natural gas is delivered through a 4-in. line at 30 lbs. high pressure to the reversing valve which switches alternating heat cycles from chamber to chamber.

While molten, the glass is "heat ray proofed" by the addition of iron oxide in ferrous state, plus cobalt which gives it a bluish tone. The iron oxide has the quality of shutting off infra-red rays completely, and can be increased or decreased in percentage as required. Ninety per cent of the glass turned out by rollers for construction purposes is in corrugated plate form, with the remaining 10% in clear plate braced with wire inlay. Thus, natural gas is aiding the all-important aircraft division of the national defense program by increasing the capacity of this huge Missouri plant.

■ ■

Dow Chemical Co. Plans to Tap Natural Gas Wells

Dow Chemical Co., Freeport, Texas, is negotiating to lay a system of pipe lines to tap natural gas wells within a radius of 125 miles of the $18 000,000 Freeport plant. The company plans a $1,000,000 addition to the plant to turn out 150 tons of ammonia per day from hydrogen gas from the Gulf Coast's natural gas wells. The plant, now using about 75,000,000 cu. ft. of gas per day, will need between 180,000,000 and 200,000,000 cu. ft.

Everdur

A Name Grown Stronger with a Nation's Strength

IN TIMES OF PEACE, Everdur, The American Brass Company's copper-silicon alloy won itself an enviable reputation as the ideal metal for hot water heater tanks. Its unusual resistance to corrosion, its superior welding properties and tensile strength comparable to that of mild steel, led most manufacturers of automatic gas water heaters to standardize on Everdur for non-rust models.

And, in this emergency, those very same advantages have made Everdur essential to the nation's program of defense. As you'd expect, Everdur hot water heaters have been drafted into service at army cantonments throughout the country. But there, the story only begins. This vital alloy has proved its "metal" for Uncle Sam on land, on sea, and in the air in many other ways.

For that reason, as national defense forges further ahead, the need for this important alloy becomes ever greater. And in this situation, there can be no compromise. Uncle Sam must have first call. Naturally, therefore, some decrease in supplies of Everdur for peace time purposes must be expected.

But meanwhile, remember, in our effort to provide the government with more and better defense material, we are throwing our every resource into research and development. Our production facilities have been stepped up to their peak. The quality and usefulness of Anaconda products will be advanced to an even greater point. And when the clouds of the present emergency have rolled away, those who now may do without our useful metals, in turn, will share these greater benefits.

ANACONDA
from mine to consumer

"Everdur" is a trademark of The American Brass Company reg. in the United States Pat. Off. 4158

Everdur (copper-silicon) METAL

THE AMERICAN BRASS COMPANY, General Offices: Waterbury, Connecticut

Subsidiary of Anaconda Copper Mining Company

In Canada: ANACONDA AMERICAN BRASS COMPANY, LTD., New Toronto, Ontario

ASSOCIATION *Activities*

Defense Keynotes A. G. A. Meeting

IN ACCORDANCE with the policy determined upon in a period of national emergency by the Executive Board, the annual meeting of the American Gas Association in Atlantic City, October 20-22, it will be reduced in length and number of meetings, and the subjects discussed will be confined to the most important problems of the industry.

Subjects in the general sessions are as follows:

1. The National Defense and the American Gas Associatin.
2. Promotional Policies in the National Emergency.
3. Emergency and Post-Emergency Research Program.
4. Nutrition and the National Defense.

In addition, special addresses have been arranged for the general subscription luncheon on Wednesday, October 22, which will end the annual meeting.

The Technical, Residential, Accounting and Industrial Gas Sections will hold their meetings on Monday morning and Tuesday afternoon, while the Natural Gas Section meeting will be on Monday afternoon. The Home Service Breakfast will be held on Tuesday morning. The annual presentation of awards by President Strickler will probably take place at the Tuesday evening dinner. These include the Charles A. Munroe Award, the American Gas Association Meritorious Service Medal, the Beal Medal and the McCall Award.

At the Natural Gas Section meeting on Monday afternoon an address will be given on "England — Its Civilian Protection and Gas Utility Operations in Wartime," by Davis v. DeBard, vice president, Stone & Webster Service Corp., New York. Mr. DeBard has a great deal of information concerning the operating and civil protection problems of gas companies in England. The problems of the gas utilities in this country in connection with the national defense program will be explored at the same natural gas session by a group of executives representing the Pacific Coast, Southwest, Middle West, Appalachian and Great Lakes areas. This panel discussion will cover operating problems, service of war industries, army camps, priorities, civilian protection problems and other related phases of the defense program.

A study of "Alternative and Auxiliary Gases from Liquefied Products" will be presented by C. George Segeler, American Gas Association utilization engineer. Mr. Segeler's paper will cover: first, a comprehensive survey of the present status of the use of liquefied petroleum gas products by the gas utility industry; second, the evaluation of the possible carrier gases to see which combination would yield a substitute gas closest in its properties to the characteristics of natural gas. Pertinent activities of the Natural Gas Section which were not described at the Dallas Convention will be reviewed in a report by H. D. Hancock, chairman of the Natural Gas Section and president, Gas Advisers, Inc., New York. In addition, there will be reports of the Main Technical and Research Committee and other groups, and election of officers.

The Industrial and Commercial Gas Section program has been prepared under the leadership of Chairman H. Carl Wolf, president, Atlanta Gas Light Co., Atlanta, Ga., and J. P. Leinroth, Public Service Electric & Gas Co., Newark, N. J., who heads the Program Committee. One entire session will be turned over to talks on the use of gas in national defense, while the remaining session will be set aside for a thorough review of the profitable commercial gas load. In his opening address, Chairman Wolf will analyze the growth of industrial and commercial gas, the development and improvement of gas equipment, as well as competitive conditions in the large number of fields covered by this branch of the gas industry.

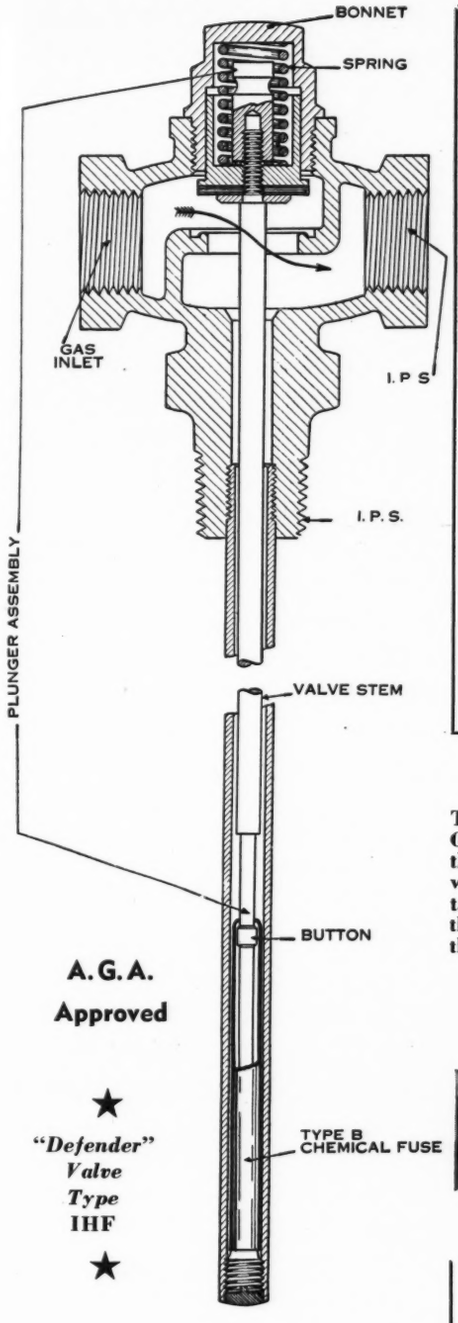
A group of executives, representing different sections of the country, will discuss the effect of national defense load on their own companies and neighboring territories, thus offering an authoritative, up-to-the-minute review of what gas is doing in national defense factories. Among those who have already accepted invitations to participate in the symposium, "Industrial Gas at Work in the Present Emergency," are: Herman Russell, president, Rochester Gas & Electric Corp.; Edward J. Tucker, general manager, Consumers Gas Co. of Toronto; Walter C. Beckjord, vice president and general manager, Columbia Gas & Electric Corp., New York; J. V. Strange, vice president, United Gas Public Service Co., Houston, Texas; Frank H. Adams, president, Surface Combustion Corp., Toledo, Ohio; and F. M. Banks, vice president, Southern California Gas Co., Los Angeles.

At the session devoted to commercial gas business, two leading manufacturers of heating equipment will give talks on "Increasing Your Heating Business in Commercial Establishments," while O. F. Keune, sales manager, Florida Power & Light Co., Miami, will speak on "Opportunities I See for Selling Commercial Gas." Climax of the meeting will be a dramatic demonstration of modern and attractive commercial gas appliances by Carl Sorby, promotion director, Geo. D. Roper Corp. Mr. Sorby's theme will be "The New Counter Gas Appliances — Your Tools for Future Business—See 'Em! Know 'Em! Sell 'Em!" All delegates to the annual meeting are invited to visit the exhibit of industrial gas equipment for the defense industries which will be held by the Industrial and Commercial Gas Section at the National Metal Exposition in nearby Philadelphia, October 20-24.

Tentative plans for the Residential Section program feature a forum of sales managers and other executives for the purpose of considering merchandising and sales activities in the light of the present unusual conditions. The possibility that only a restricted number of domestic appliances will be available next year, curtailed credit regulations, and other emergency-born problems have created many timely subjects for discussion. R. J. Rutherford, vice president, Worcester Gas Light Co., Worcester, Mass., chairman of the Residential Section, will present the highlights of the year's residential sales activities in his annual address.

A second session of the Residential Section will include brief talks of incoming committee chairmen outlining their programs for the coming year. Prize-winning salesmen in the CP Ranger Club and winners of the national refrigeration campaign will also be presented. An added attraction will be an address on sales promotion by an executive outside of the gas industry.

The Accounting Section is planning



A.G.A. Approved

★

"Defender" Valve Type IHF

★

WHEN THE WATER GETS

too HOT for Safety

this **K-CO** valve

SHUTS OFF THE GAS!

The KITSON patented "Defender" anticipates excessive temperatures by completely shutting off the main gas supply just below the danger point. This valve offers *complete insurance* against the consequences of "sticky" thermostats because *it shuts off the main gas supply before any physical damage can be done, and keeps it shut off until the cause of the thermostat trouble can be investigated and removed.*

Thus, positive protection is assured against the stress on tanks, flooded basements and other dire consequences possible in an over-heated domestic water system.

HOW IT OPERATES

The KITSON "Defender" Emergency Gas Shut-Off Valve can be installed at the hot water outlet in direct contact with the heated water at the top of the tank. Note the long stem, insuring that the chemical fuse within is in direct thermal contact with the water in the hottest zone at the top of the tank. Immediately the temperature of the water reaches its safety limit beyond the set shut-off temperature of the thermostat, the chemical fuse melts, and the valve shuts tight cutting off the main gas supply to the water heater burner. *The real protection therefore is that it puts the finger on a faulty thermostat.*

Simply and quickly the chemical fuse cartridge can be renewed when the thermostat trouble is repaired.

The KITSON "Defender" Emergency Gas Shut-Off Valve offers positive and complete protection for automatic water heating. That is why many gas companies specify it as standard equipment.

FREE OFFER: Test it for yourself! We will be glad to send any gas company a sample of the KITSON "Defender" for examination and test. Be sure to specify the size. Also, ask for Catalog "A" covering the complete line of Kitson gas industry brass fittings.

KITSON COMPANY
1500 Walnut St., Philadelphia, Pa.

• SAFETY CONTROLS for MANUAL and AUTOMATIC WATER HEATERS • QUALITY BRASS GOODS for GAS, WATER and ALL PLUMBING USES

Since 1897

KITSON
EMERGENCY SHUT-OFF
GAS VALVE

to hold committee discussions designed along the familiar lines of previous years, with special emphasis on the luncheon conference idea. There will be a business meeting for the purpose of electing officers and receiving committee representatives, but no general accounting session such as that held last year.

Two complete sessions have been arranged by the Technical Section for the engineers, chemists and other operating men. The first session will include the address of the chairman, D. P. Hartson, Equitable Gas Co., Pittsburgh, Pa., and comprehensive reports of the following committees: Chemical, Distribution, Gas Production, Gas Conditioning and Motor Vehicles. Technical problems raised by the defense program will be dealt with. The second technical session will be devoted to papers on four subjects of current interest, namely: The Dilution of Coke Oven Gas with Blue Gas, Service Trends and Problems, Motor Vehicle Operation and Pyridine Recovery. Several gas utility authorities will present the latest information on these topics.

■ ■

N. P. A. Completes Plans For Annual Convention

Plans for the 39th Annual Meeting of the National Petroleum Association to be held at the Traymore Hotel, Atlantic City, N. J., September 17-19, are nearing completion, according to a recent announcement made by N. H. Weber, president of the Association.

The general sessions will be held in the afternoon on September 17 and 18. Committee and group sessions will be held during the mornings on those days. A fellowship banquet will be held at the Traymore on Thursday, September 18, at 6:30 p. m. Members of the association and their guests are invited to the annual breakfast party at the Seaview Country Club on Friday, September 19, at 10 a. m. Hosts for the breakfast will be The Pennsylvania Refiners. Reservations for the convention should be made promptly to the Hotel Traymore, Atlantic City, N. J.

■ ■

Mid-West Gas School Will Feature Meter Shop Course

The 21st Annual Gas School and Conference, sponsored by the Mid-West Gas Association and held in connection with the Engineering Extension Service of Iowa State College, which is to be held at Ames, Iowa, September 8-10, will feature a gas meter shop course consisting of actual bench work for repair men.

The class will be limited to 50 men and reservations for a place in this class should be addressed to J. C. Clark, Northern States Power Co., Fargo, N. D. Allen MacLean will present a paper at this section which was added following the realization by the Association that trained meter repair men will be of special value if material shortages reduce the supply of new meters.

Sectional meetings will include: Production, Distribution, Utilization (Section "A"), Utilization (Section "B"), Metering, and Meter Repair Bench Work. The Executive Committee is composed of H. K. Wrench, Minneapolis Gas Light Co., general chairman; T. E. Rooke, Geo. D. Roper Corp., vice general chairman, and R. B. Searing, secretary-treasurer.

Eugene O. Olson, Iowa State College, is chairman of arrangements, and C. A. Bland, Iowa Power and Light Co., vice chairman. J. C. Clark, Northern States Power Co., is chairman of the meter section, and J. L. Griffin, Northern Natural Gas Co., is vice chairman. E. E. Miller, Iowa-Nebraska Light and Power Co., is chairman of the utilization section, and P. L. Covell, Minneapolis Gas Light Co., is vice chairman.

Chairman and vice chairman of the production section are M. K. Wrench, Metropolitan Utilities District, and A. M. Rader, Minneapolis Gas Light Co. George C. Holmes, United Light and Power Service Co., is chairman of the distribution section, and L. Shomaker, Northern Natural Gas Co., is vice chairman.

■ ■

National Metal Congress and Exposition Is October 20-24

The A. G. A. Combined Industrial Gas Exhibit, 1941 National Metal Congress and Exposition will be held in Philadelphia, Pa., October 20-24. This year, the section will use over 5000 sq. ft. of space which will be filled with exhibits of 17 leading manufacturers of gas-using equipment for the metal industries.

A group of gas companies serving in and near Philadelphia have contributed to make available effective unified decoration for the entire area, as well as to supply men to man the display in addition to the manufacturers' representatives and the representatives of the A. G. A. who will be present.

CALENDAR

September

Mid-West Gas School and Conference—Ames, Iowa, September 8-10.

Pacific Coast Gas Association—Annual Convention, Del Monte, Calif., September 10-12.

American Trade Association Executives—Hershey, Pa., September 11-13.

October

West Virginia Oil and Natural Gas Association—Annual Convention, Clarksburg, W. Va., October 2-3.

National Safety Congress and Exposition—Stevens Hotel, Chicago, Ill., October 6-10.

American Society of Mechanical Engineers—Louisville, Ky., October 12-15.

American Gas Association—23rd Annual Convention, Atlantic City, N. J., October 20-22.

A.G.A. Combined Industrial Gas Exhibit, 1941, National Metal Congress and Exposition—Philadelphia, Pa., October 20-24.

Fall Meeting, Petroleum Division, American Institute of Mining and Metallurgical Engineers—Ambassador Hotel, Los Angeles, Calif., October 29-30.

California Natural Gasoline Association—Los Angeles, Calif., October 31.

November

Mid-Southeastern Gas Association, Annual Meeting, and Institute for Gas Plant Operators—State College, Raleigh, N. C., November 13-14.

December

National Industrial Council—Waldorf-Astoria Hotel, New York, N. Y., December 1-2.

American Society of Mechanical Engineers—Annual meeting, New York, N. Y., December 1-5.

New Mexico Oil and Gas Association—Artesia, N. M., December 5.

July Laboratories' Directory Is Largest Ever Published

THE July 1, 1941, Directory of Approved Gas Appliances and Listed Accessories, published by the American Gas Association Testing Laboratories, contains 90 pages more than the corresponding issue published a year ago.

The Directory gives information concerning the Testing Laboratories' certification program for the protection and convenience of gas consumers and others interested in the purchase and sale of gas appliances and accessories that have been judged suitable for consumer use. More than 17,000 basic models of gas appliances for practically every heating use are listed.

All equipment listed in the Directory complies with the American Standard requirements covering their durable construction and safe and efficient performance as determined by actual test in the Testing Laboratories, located in Cleveland and Los Angeles.

Production models of certified equipment are rigidly inspected by Laboratories' inspectors not only at manufacturers' plants, but at dealers' and jobbers' warehouses and sales floors to make certain that they have been constructed in exact conformity with models originally tested and approved. In recent years, inspection visits have also been made in increasing numbers in consumers' homes, thus serving the double purpose of checking certified equipment and also its installation.

■ ■

Changeover to Natural Gas Completed in Eureka, Calif.

On August 29, the changeover from manufactured oil to natural gas was completed by the Pacific Gas and Electric Co. at Eureka, Calif., and over 1900 domestic users began burning natural gas supplied from a group of wells at Thompkins Hill, about 14 miles south of Eureka. A 4-in. pipe line has been laid from the wells to the distributing system, and the plant which formerly manufactured gas from oil at Eureka will be maintained as a standby service.

Adjustment of appliances was started on August 14, with crews of trained men making a house-to-house inspection of all appliances, cleaning burners and adjusting valves to suit natural gas. With each crew was a special truck equipped as a traveling machine shop, where parts were cleaned in lye, burners needing drilling were serviced and the work of adjustment facilitated. The advent of natural gas at Eureka will result in cutting down gas bills to householders about 30%.

■ ■

Modern Arkansas Army Post Is Gas-Served City of 25,000

Arkansas' Camp Joseph T. Robinson, near Little Rock, is comparable to a modern city of 25,000 which uses natural gas for heating, cooking and hot water heating.

Completed in January of this year, the camp, which houses 25,000 men, has 6767 buildings and 126,550 ft. of gas mains. During the month of February, 142,603,000 cu. ft. of natural gas passed through the camp mains.

Seventy-five thousand meals are cooked daily for the men on heavy duty gas ranges. Each of the 6200 tents houses five men and is equipped with a gas-fired circulating heater. Hot water is always available in the many shower rooms which are used by the entire company at the close of each day.

The Arkansas Louisiana Gas Co.'s measurement station for the army post is located near the camp.

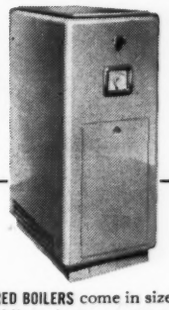
THE SIGN OF *Quality*

in Gas-fired Heating, Winter Air Conditioning and Hot Water Equipment

The name American Radiator and Standard Sanitary Corporation is the Best Known Name in Heating and Plumbing. On GAS-FIRED Heating, Winter Air Conditioning and Hot Water Equipment it is a recognized sign of quality — of dependability and economy.

Every product in this complete line has been soundly engineered by GAS heating experts. There are AMERICAN Gas Boilers in many sizes — and SUNBEAM Warm-Air Furnaces and Winter Air Conditioners to meet virtually any need.

AMERICAN HEATING EQUIPMENT COSTS NO MORE THAN OTHERS



AMERICAN GAS-FIRED BOILERS come in sizes to heat any size building, from a cottage to an office building. On the "Empire" models as shown above, jackets are handsomely finished in Canyon Two-Tone Red and enclose all controls.

There's a complete line of **SUNBEAM GAS-FIRED WARM-AIR FURNACES AND WINTER AIR CONDITIONERS.** Shown above is the **MOHAWK WINTER AIR CONDITIONER,** available in 9 sizes with Btu inputs ranging from 60,000 to 300,000 per hour.

AMERICAN RADIATOR & Standard Sanitary

New York **CORPORATION** *Pittsburgh*

Cast Iron & Steel Boilers & Furnaces • Radiators • Cast Iron Enameled & Vitreous China Plumbing Fixtures & Plumbers' Brass Goods • Winter Air Conditioning Units • Water Heaters • Heating Accessories

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★ ★ DEFEND OUR COUNTRY. ENLIST NOW IN THE U. S. REGULAR ARMY ★ ★

Air Conditioning Aids Medical Science

AGAIN, gas summer air conditioning has proved its versatility—has helped further medical science and the cause of national defense!

From the American Medical Association convention in Cleveland recently comes the story of a unique gas-fired summer air conditioning application for the drying of blood plasma for *future* transfusion use. This development is especially valuable during war periods, when there is great need of large quantities of blood for shock transfusions, loss of blood treatment, etc. Speed, of course, is of utmost importance in such cases — and, until now, it has been necessary to obtain donors with the correct type of blood at the crucial moment. This generally delays treatment.

Dr. F. W. Hartman of the Henry Ford Hospital, Detroit, Mich., is developer of the new process for drying blood plasma for future transfusion. He feels that his method offers definite advantages over the present accepted methods (most of which involve freezing the blood and allowing the water to evaporate from the frozen state by putting a low vacuum on the frozen material). These advantages are speed, greatly increased production, simple and inexpensive equipment, facility in handling, and the fact that this dried plasma can be used in giving a transfusion to anyone, regardless of his type of blood.

At the Henry Ford Hospital, Dr. Hartman takes blood samples from donors, places them in suitable containers, and adds a chemical to keep them from coagulating. These samples are then deposited in a refrigerated box. The red corpuscles separate from the mass, leaving a clear amber colored solution on top. This is the plasma, and contains the necessary elements (such as proteins) which are needed for use in normal blood transfusions. It is now drawn from the tops of the containers and is placed in cylindrical cellophane tubes or bags, approximately 30 in. long and about 4 in. in diameter. These are then sealed on both ends, and are ready for drying.

To dehydrate the blood samples, Dr. Hartman employs a Bryant gas-fired No. 5 dehumidifier, with a capacity of 500 c.f.m. Silica gel is the dehydrating agent. On top of the Bryant unit, Dr. Hartman has built a box large enough to house two sets of wheels mounted on a common shaft and rotated together by a small motor. Across these two wheels five or six of the cylindrical tubes containing fluid plasma are turned up. The box enclosing the wheels is so baffled that the dry air leaving the gas dehumidifier flows over a cooling coil fed with either cold water or brine. This dehumidified air then moves across the rotating wheels and is discharged into the drying unit. The moisture from the plasma seeps through the cellophane walls, placing the wetted outer surface in contact with the dry air stream. The dehumidified air first picks up this moisture. The air is then returned to the silica gel machine where it is redried and recirculated for continuous use.

After a drying period of about four hours, the resultant product is an amber colored powder in crystalline form. In this dried state it may be stored for indefinite periods without special precautions, except for sealing in sterile containers. For actual use, this powdered plasma (blood) is mixed with sterile water and transfusions given in the usual manner. The drying process must be carried out at a relatively low temperature so that the properties of the plasma may be retained. As yet, the proper temperature has not been determined. The entire assembly, including the drying unit, is about 5 ft. high and occupies a floor space of about 42 in. by 43 in.

Dr. Hartman's outstanding scientific display of his apparatus, which won a certificate of merit at the American Medical Association convention, has received the particular approval of Army and Navy doctors. The gas industry is proud that the newly developed gas summer air conditioning equipment is contributing in this way to national defense.

■ ■

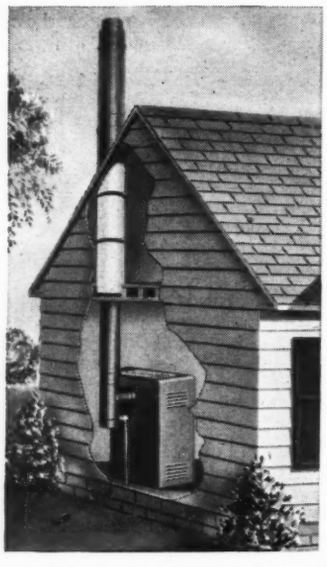
Commodity Year Book Says Gas Produced in 24 States

The 1941 Commodity Year Book, which is an annual statistical and research compilation of the Commodity Research Bureau, Inc., states, "At the present time, there are at least 24 states in which natural gas is being produced and marketed in commercial quantities."

The gas section of the book further states that approximately 1500 gas companies supply 18,000,000 customers with the fuel. The industry employs 132,700 persons and pays to Federal, state and local governments, $95,196,000 in taxes.

Four pages of statistical tables show the production of natural gas in the last 10 years by states, the consumption of natural gas in the last 10 years, and the average price of the product at various points of consumption.

DURASTAC . . . the LOW COST CHIMNEY for GAS installations



- Easily Installed
- Quickly Dismantled
- Eliminates the Effects of Condensation
- Increases Heating Efficiency

The Skuttle DURASTAC vitreous enamel-lined chimney was developed to give builders and heating contractors a practical and low cost lined chimney that is easily and quickly installed, yet is far superior to the ordinary masonry chimney.

By installing a DURASTAC non-corrosive chimney not only are the effects of the products of combustion eliminated, but the operating efficiency is increased as well. The illustration at the left shows a typical installation. Write Department GA for descriptive literature and prices.

• All DURASTAC sections are seam-welded, Armco metal coated inside and out, with a special high temperature acid resisting vitreous enamel. The sections are made in stock sizes from 3" to 10" in diameter, of 6", 12" and 24" standard lengths; 22½°, 45° and 90° elbows and open or closed tees, with drain provision, also oval to round union joints.

SKUTTLE *Sales* COMPANY
Air-Conditioning Equipment
1015 FRANKLIN ST. • • • DETROIT, MICHIGAN

Write Dept. GA for Prices and Literature

Selected for Venting in Five More Major Housing Projects . . .

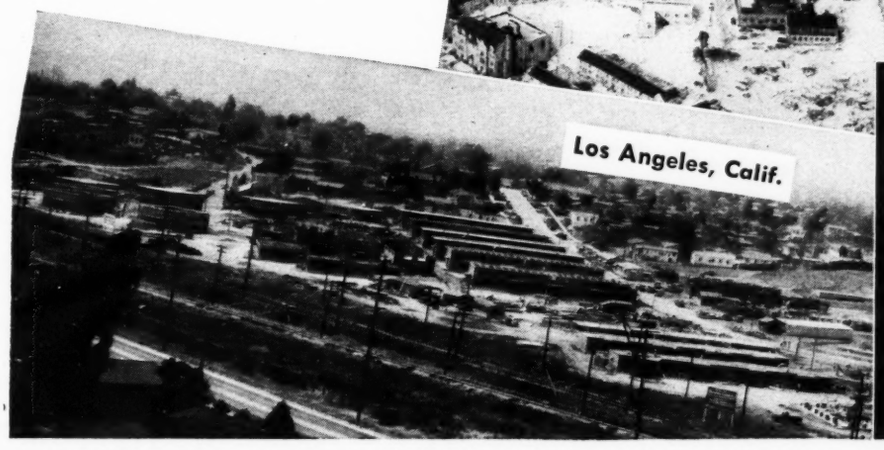
J-M TRANSITE FLUE PIPE

IN these five housing projects, gas was selected for heating systems. And in these, as in scores of other similar projects all over the country, Johns-Manville Transite Flue Pipe is used for venting.

Made of asbestos and cement, Transite Flue Pipe is especially designed for venting gas-burning appliances. Being non-metallic, it cannot rust . . . is unusually durable, highly resistant to weather and corrosion.

Furthermore, Transite Flue Pipe is economical to install. Its relatively light weight makes handling easy. And it comes in a complete range of sizes and fittings that permit crews to work rapidly, economically . . . even in cramped working quarters.

Why not check the many advantages of J-M Transite Flue Pipe for use on your next job? Brochure TR-13A gives complete details. For your copy, just write Johns-Manville, 22 East 40th St., New York, N.Y.



Johns-Manville TRANSITE FLUE PIPE

Vegetables Are Burned to Find Oil

BURNING vegetables to find oil is the newest exploration wrinkle advanced by petroleum scientists, according to a recent release from the American Petroleum Institute.

Hypothesis, yet to be adequately proved, is based on the fact that certain plants tend to concentrate particular basic chemical elements in their tissues, when traces of these elements exist in the soil. If certain elements can be proved present in a specific underground geologic formation at one oil field, and if analysis of plant ashes in another location shows the same elements, chances are the same geologic formation is buried under the spot where the plants grew.

Oil men for some years have been following particular geologic formations, that proved productive in one part of the country, for hundreds of miles in the hope that the formation that hid an oil sand in Texas, for example, will also have oil sands in Mississippi. Core drilling and micropaleontology, relatively expensive, have been used in this type of oil exploration. Now plant-ash analysis may be a useful new tool for the same quest.

The trend in petroleum exploration, geologists report, is not to the use of one particular method to the exclusion of all others. Rather it is to evaluate all methods and to use one or several.

Dozens of tools now are available to oil men, and practically all of them have value in specific problems. Besides the older sciences of geology and geophysics—seismic, gravimetric, magnetic, and electrical—the petroleum prospector can call upon core drilling; micropaleontology and petrology; electrical, gamma-ray, chemical, and continuous drilling-mud well-logging; soil-gas and surface-gas analysis; side-wall sampling; wire-line coring; pressure core barrels; geothermal methods; and aerial photography.

Today's wildcatters have the tools, from measuring the seismic sounds of miniature explosions to burning vegetables, and they are using them. One out of every five exploratory wells drilled in 1940 on a scientific basis found a new oil field; of the wells located without scientific help, only one in 24 was successful.

TITAN

TITAN CONTROLS

READY FOR ACTION

ALL DAY EVERY DAY

TO ASSURE

DEPENDABLE WATER HEATER SERVICE

THE TITAN VALVE AND MANUFACTURING CO.

9913 Elk Avenue

CLEVELAND, OHIO

Texas Companies Build Pipe Lines for Defense Projects

CONSTRUCTION crews of Lone Star and Community Natural Gas Companies in Texas are now building pipe lines for national defense projects at top speed.

A one-mile tap line has been built by Community Natural to tie into the Lone Star's 10-in. main transmission line near Pottsboro, Grayson county, in order to serve a new U. S. Army Air Corps Basic Flying School near there.

A Federal housing project for families of men stationed at a similar school in San Angelo will be supplied gas through one mile of two-in. and a mile of three-in. intermediate pressure lines constructed recently by Community Natural.

Construction has been completed by Lone Star on three miles of 12-in. pipe line on the outskirts of Wichita Falls to supply gas for the U. S. Army's Wichita Falls Air Corps Technical School.

The Fort Worth division of Lone Star is now planning to lay nine miles of 12-in. line to serve the Consolidated bomber assembly plant at Lake Worth, near Fort Worth.

■ ■

Industrial Gas Sales Gain 15.1% in First Five Months

Industrial sales of natural gas in May were 19.7% greater than a year ago. Sales of natural gas reported to the American Gas Association for all purposes in May were 10.6% greater than the same month last year.

Industrial consumption, as indicated by figures on sales of utility companies, increased 15.1% for the first five months while the total demand was up 7.3%.

Industrial customers, according to the A.G.A. reports, totaled 42,100 at the end of May, an increase of 5.5%. The modest gain in the number of industrial consumers compared to the gain in volume of gas used indicates a substantially larger increase in consumption per customer.

Total sales of natural gas for all classes of consumption in May were 120,557,700,000 cu. ft., compared to 108,960,000.000 cu. ft. in the same month last year. Five months' sales this year aggregated 727.842,400,000 cu. ft., against 678 209,700,000 cu. ft. in the same 1940 period.

■ ■

P. G. & E. Receives 50-Year Franchises for 14 Counties

The California Railroad Commission has issued certificates to the Pacific Gas and Electric Co., San Francisco, to exercise 50-year franchises in 14 northern and central California counties. Counties involved include: Butte, Plumas, Yolo, Napa, Sutter, Fresno, Merced, Santa Barbara, Madera, Kings, Tehama, Kern, San Luis Obispo, and Mariposa.

The City Council of Bakersfield, Calif., has granted the same company a franchise giving it the right to distribute gas within the city limits for the next 50 years or until 1991.

■ ■

Rochester, Minn., to Conduct Gas Survey in Four Schools

Natural gas equipment will be installed in four city schools of Rochester, Minn., as a year's experiment in heating costs. At the end of the period a survey will be made to determine the cost of the heat supplied by natural gas at the four schools and further use of the gas will depend upon the results of this experiment.

THAT'S WHAT I'D LIKE - A MAGIC CHEF CP GAS RANGE
Use Gas... The modern wonder fuel.
Magic Chef CP (Certified Performance) ranges make gas cooking quicker, cleaner, cheaper.

248 MILLION CP MESSAGES
for Magic Chef have rolled off the big magazine presses since September, 1939.

Copr. 1941, American Stove Co.

NATIONAL ADVERTISING STARTS AUGUST 20—WITH 38,000,000 SHOTS THIS FALL

MILLIONS of messages for home defense . . . telling Mrs. America the story of modern gas cooking with a Magic Chef Gas Range. Capping 23 consecutive years of consistent *big space* advertising in leading national big circulation magazines, Magic Chef continues to help keep the home fires burning in American kitchens with the Magic Flame of Gas.

Every one of our new magazine ads, as they have for the past three years, carries a CP message, playing up "Use Gas, the modern wonder fuel" and featuring our little Chef figure with a CP Seal. All designed to keep women sold on gas cooking the modern way, with a Magic Chef Certified Performance Range.

Six leading magazines carry the Magic Chef story, starting with these:

SEPTEMBER ISSUES	NEWSSTAND DATE
Good Housekeeping	August 20
Better Homes & Gardens	August 22
Ladies' Home Journal	August 29
Saturday Evening Post	Sept. 3
Woman's Home Companion	Sept. 19
American Home	Sept. 25

Miss America

IS WITH US AGAIN!

ALL DRESSED UP IN COWGIRL STYLE — HEADING OUR OLD RANGE ROUND-UP. If you're planning a Round-Up campaign this year, let Miss America help you. Roy Rogers is in it, too. See our new and different Round-Up campaign, just out in a special dressed up issue of Magic Chef Magazine. Write now for details of sales helps for your fall campaign.

AMERICAN STOVE COMPANY

World's Largest Manufacturer of Gas Ranges

BOSTON . . . NEW YORK . . . ATLANTA . . . CLEVELAND
CHICAGO . . . ST. LOUIS . . . PHILADELPHIA . . . SEATTLE
SAN FRANCISCO . . . LOS ANGELES . . . PITTSBURGH
BALTIMORE . . . WASHINGTON

INDUSTRY *Personalities*

Several appointments recently announced by **C. H. Waring,** chairman, A. S. A. Sectional Committee, A. G. A. Approval Requirements Committee are as follows: **C. A. Olsen,** president of the C. A. Olsen Manufacturing Co. and president of the National Warm Air Heating and Air Conditioning Association, was appointed to represent that group on the Approval Requirements Committee. **Prof. S. Konzo,** Warm Air Heating Research Residence, University of Illinois, was also selected to represent that group on the Subcommittee on Approval Requirements for Central Heating Gas Appliances.

A. R. Bailey, assistant to the president, Coast Counties Gas and Electric Co., was appointed chairman of the Subcommittee on Approval Requirements for Central Heating Gas Appliances. **H. W. Geyer,** unitization engineer, Southern Counties Gas Co., was appointed to succeed Mr. Waring as chairman of the Subcommittee on Approval Requirements for Gas Water Heaters. **E. H. Eacher,** assistant to the president, Boston Consolidated Gas Co., was designated to fill the vacancy created by these changes. **S. A. Kuntz,** engineer, Philadelphia Electric Co., was appointed chairman of the Subcommittee on Listing Requirements for Gas Conversion Burners. **C. F. Henness,** general supervisor gas sales, Public Service Co. of Northern Illinois was also appointed to this committee. **A. B. Banowsky,** commercial sales division, United Gas Corp., was appointed to head the newly formed Subcommittee on Approval Requirements for Gas-Fired Duct Furnaces.

• •

Lt. Donald Weir is being granted a leave of absence from the insurance department of the Arkansas Natural Gas Co. and affiliated companies, Shreveport, La., to enter active duty in the U. S. Army, Sixth Field Artillery Battalion, Fort Bragg N. C.

• •

Mrs. Richard Cope, home service director of the Arkansas Power and Light Co., has been appointed a member of the home service committee of the Southern Gas Association for the year 1941-42, according to **L. L. Baxter,** secretary-treasurer of the association.

H. H. Cleland and W. F. Raber

After 50 years of distinguished service as a gas, electric and street railway executive, **William F. Raber,** president of the San Diego Gas and Electric Co., San Diego, Calif., presented his resignation to the company's board of directors last week. The board immediately elected **Hance H. Cleland,** president of the California-Oregon Power Co., as his successor. Mr. Cleland will take office immediately. Mr. Raber will remain with the company in an advisory capacity to the president and board of directors.

Mr. Raber became the directing head of the utility in 1924. During his 17 years in San Diego, Mr. Raber has seen his company grow from 81,997 gas and electric customers to the present total of 190,414. Over $4,000,000 in rate reductions have been passed on to local customers during his administration. Aside from taking an active interest in both gas and electric trade associations Mr. Raber has, for the past 13 years, been active in San Diego civic affairs.

The resignation of Mr. Raber and the election of Mr. Cleland as president of the company had been expected for several months. Mr. Raber had expressed a desire to terminate his office but had agreed to remain with the company until plans for meeting national emergency requirements were well under way. Mr. Cleland is a former member of the Public Service Commission for the State of Washington and served as president of a large Northwestern utility. He was also Assistant Attorney General for the State of Washington and has been engaged in private law practice in Olympia, Wash., and Chicago.

• •

Herbert H. McMurray has been appointed advertising manager of the Washington (D. C.) Gas Light Co., succeeding the late **Wilmot R. Squier.** (*GAS*, August, pg. 52.) Mr. McMurray, former assistant advertising manager of the company, has been with the firm since 1930 and has been doing special promotion work for the last 18 months. He is a graduate of DePauw University and National University, Washington, D. C. Before coming to Washington he was an instructor at Berea college. Mr. Squier resigned as advertising manager of the company on December 31, 1940.

• •

Nathan H. Gellert, former manager of the Independence Gas Co., Independence, Iowa, which sold its properties to the Polk-Peterson Corp. and Carleton D. Beh Co., both of Des Moines, is now vice president of the North Carolina Gas Corp. and in charge as manager of the Lexington, N. C., plant of the company. Mr. Gellert is a graduate of Yale college.

• •

W. A. Dunkley, director of the gas division of the Memphis Light, Gas & Water Division, has announced the appointment of **T. Cecil Wray** to the position of superintendent of gas distribution, succeeding the late

DON'T DIG TRENCHES

. . PUSH PIPE WITH GREENLEE HYDRAULIC PIPE PUSHERS

You don't waste time and money digging trenches when installing pipe underground with Greenlee Hyraulic Pipe Pushers. There's no pavement cutting, no tunneling, no backfilling, no repaving. Only a short trench is dug to accommodate the pusher and pipe, and one or two men pumping the handles can easily push pipe under sidewalks, streets, highways, embankments, and railroad tracks. No extra equipment of any type needed . . . the powerful hydraulic units do the actual pushing. Built in two sizes . . . the No. 790 with a 20-ton hydraulic unit for 1¼ to 4-inch pipe . . . and the No. 795, with 75 tons of power, for drainage ducts, concrete sewer pipe, and pipe beyond 4 inches. Write for complete details.

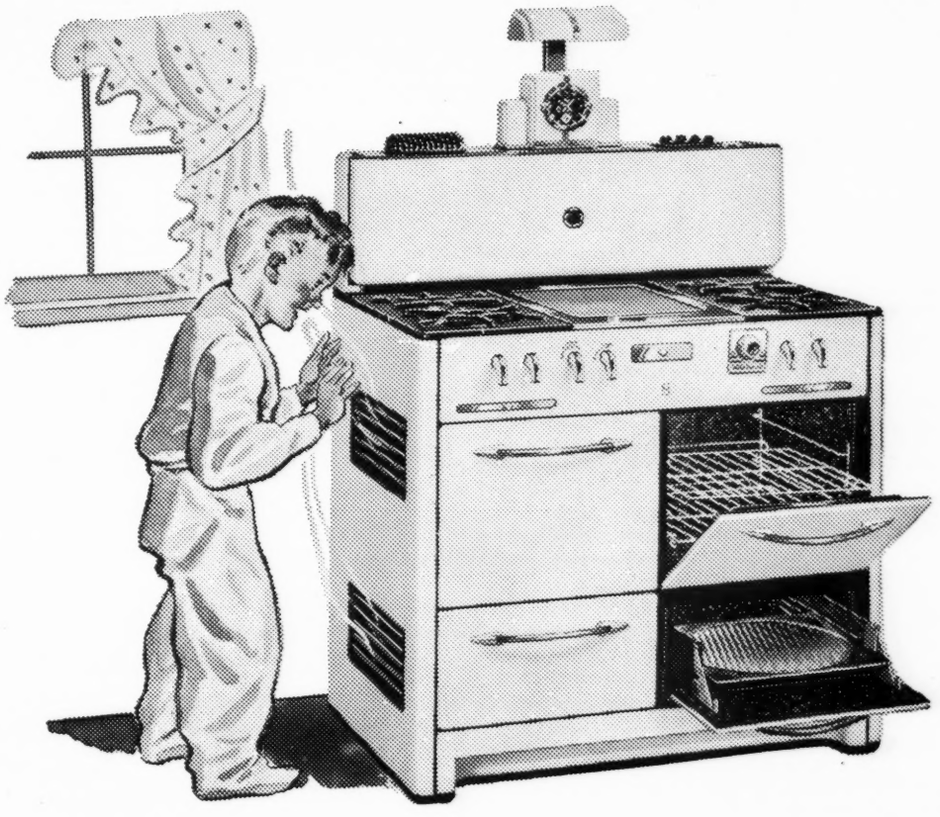
FAST . . . EASY
PORTABLE
75 Tons Power

Send for
NEW PUSHER BULLETIN S-117

GREENLEE TOOL CO.
1700 COLUMBIA AVENUE • ROCKFORD, ILLINOIS

WEDGEWOOD *Ranges*

with **BUILT-IN GAS CIRCULATING HEATER**



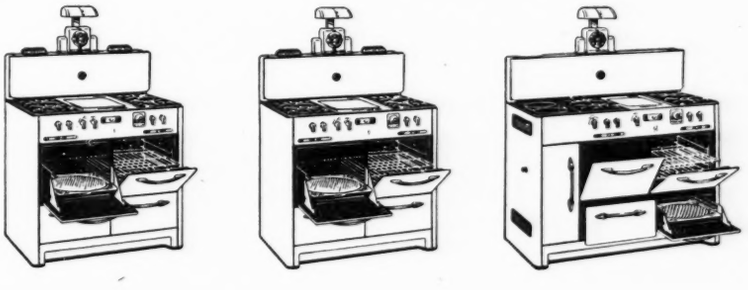
IN promoting the highest standards of cooking performance, WEDGEWOOD GAS RANGES simplify all methods of cookery . . . introduce new convenience of use . . . add to economy of operation . . . eliminate cooking failures and save fuel, food and time.

COOKS YOUR FOOD

•

There's a WEDGEWOOD Type and Size to Fit EVERY Need and Purpose.

•



HEATS YOUR ROOMS

•

WEDGEWOOD

WEDGEWOOD RANGES
MAKE NEW FRIENDS FOR GAS
THE MODERN GAS RANGE

JAMES GRAHAM MANUFACTURING CO. • Los Angeles - San Francisco - Newark, Calif. - Portland, Oregon

INDUSTRY PERSONALITIES

W. S. Myrick. Mr. Wray is a graduate of the Carnegie Institute of Technology and became an employee of the company in 1928. For the past several years he has been gas distribution engineer.

• •

A. W. Pratt, formerly of New Iberia, La., is now local manager of the United Gas Co., Bunkie, La., according to an announcement made by **D. S. McManus,** district manager of the company. Mr. Pratt has been a salesman for the New Iberia office of the company for the last six years.

• •

J. M. Barnett, formerly manager of the Franklinton, La., office of the General Gas Corp., who was transferred to Baton Rouge as head of the wholesale department recently, has received another promotion to the capacity of supervisor of the 13 branch offices of the concern located in Louisiana and Mississippi.

• •

Miss Patricia Turek, of Cleveland, Ohio, has been appointed home service representative of the Ohio Fuel Gas Co. for the Elyria district. She succeeds **Mrs. Jean McCullough Gleason,** who recently resigned her position. Miss Turek received her B. S. degree in home economics at Miami University.

• •

H. F. Blum, formerly of the Kilgore, Texas, branch of the United Gas Corp., has been appointed manager of the Vernon branch. Mr. Blum succeeds **Mr. Schuyler,** who has been transferred to the Childress office of the firm.

J. B. O'Connor, vice president of Clark Bros., Co., Inc., Olean, N. Y., has announced that **A. K. Hegeman** will be in charge of the new West Coast office of the firm, to be located in Huntington Park, Calif. **Art Rowe** will be in charge of the service department for the new office.

• •

R. E. Cramer has been appointed to the position of assistant chief inspector of laboratories with the American Gas Association and will be transferred from Cleveland to Los Angeles. Mr. Cramer is a graduate of Ohio State University with a degree in chemical engineering.

• •

Announcement of the appointment of **Miss Beth Palmer,** of Chester, W. Va., as home service representative of the Columbus, Ohio, district of the Ohio Fuel Gas Co. was made recently by **Frank S. Williams,** district manager of the company at Columbus. Miss Palmer is a graduate of Ohio Wesleyan University with a degree in home economics. She succeeds **Miss Rachel Hall** in her new position.

• •

W. L. Plummer, southeast district manager of the Geo. D. Roper Corp., has been called into service by the United States Air Corps. He has been given a leave of absence during his tenure in the service. His work will be carried on by **D. S. Sharpe** and **LeMoyne Dabbs,** representatives of the company. Mr. Plummer, recently advanced to the rank of Major, is assigned to the Traveling Cadet Boards and will serve in the states of Louisiana, Mississippi, Alabama and Florida.

W. Alton Jones, president of Cities Service Co., New York; **D. W. Harris,** vice president and general manager of the Arkansas Natural Gas Corp.; **B. R. Muirhead** and **H. T. Goss,** treasurer and chief engineer, respectively, of the same company, of Shreveport, La., have been named officers of the newly formed Cities Service Defense Corp., which will build and operate a $10,000,000 ammonium picrate plant at Marche, Ark., for the manufacture of explosives and munitions. Mr. Jones is president of the new company; Mr. Harris, vice president; Mr. Muirhead, treasurer, and Mr. Goss, secretary.

• •

BLANCHARD SMITH

The Chaplin-Fulton Manufacturing Co., Pittsburgh, Pa., has announced that Chaplin-Fulton Regulators will be represented in the Mid-Continent territory by **Blanchard Smith,** who formerly represented the Reynolds Gas Regulator Co. Mr. Smith was also employed by Westcott & Greis, Inc., of Tulsa, Okla. His territory, including Iowa and Nebraska, will comprise eight states. Mr. Smith's headquarters will be in Kansas City, Mo.

• •

The National Supply Co., Pittsburgh, Pa., recently announced the election of **Austin W. Clark** as vice president.

Mr. Clark, who attended the University of California, joined the National Supply Co. in 1940. Previous to that time he was with the Hearst Publications in New York, the Cerro de Pasco Copper Corp. in Peru, South America, and Sears, Roebuck and Co., Chicago.

• •

J. Elmer Thomas, geologist and petroleum analyst, Fort Worth, Texas, has been appointed advisory consultant in the fuel section of the price division, Office of Price Administration and Civilian Supply. He is organizing a staff of experts chosen from the gas, oil and stove industry. He has been head of geological departments of large companies and has been a consultant both in geology and economics. Mr. Thomas was the first president of the American Association of Petroleum Geologists.

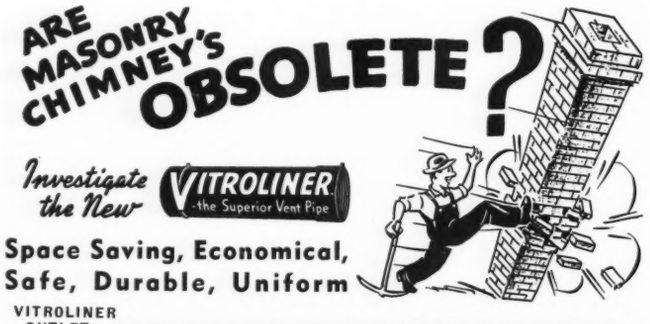
• •

George C. McGee, Dallas, Texas, has gone to Washington for service with the Office of Production Management. He has terminated his connection with the firm of DeGolyer, McNaughton & McGhee, consulting geologists and engineers.

• •

C. F. Wilson, Lone Star Gas Co. supervisor of stores, has announced the following changes in storekeeper personnel:

Community Natural and Texas Cities gas companies: **Ben C. Zoch,** warehouse clerk at Waco, has been appointed storekeeper for Community Natural at Hillsboro, replacing **Roy C. Davis. H. C. Westfall,** formerly at Stamford, replaces **Frank S. Ratcliffe,** former engineer and assistant storekeeper at Abilene. **T. J. Bridges** has been appointed storekeeper at Vernon, replacing **E. M. Ikard** who has been transferred to Stamford. **Kenneth Twyman,** formerly assistant storekeeper for the Lone Star Gas Co. at Petrolia, has been transferred to the company's Shamrock plant, replacing **Frank Stell** as storekeeper.



Showing Vitroliner with Fyrex insulation.

A practical venting system which has been in use for many years can now be used with insulation to eliminate the standard masonry chimney. It consists of lengths of acid resisting vitreous enamel coated steel pipe and fittings which are insulated with a high temperature prefabricated asbestos insulating wall one inch thick. This system of outlet and vent piping can be installed inside of partitions or walls. Provides an adequate means for venting gas appliances as required in section 1105 of the Building Code. Approved by Underwriters Laboratories, Inc.

VITROLINER -the Superior Vent Pipe
Trade Mark Registered
CONDENSATION ENGINEERING CORPORATION
Ask our engineering department to help you solve any difficult and unusual venting problems.
2515 ARCHER AVENUE • CHICAGO, ILL. • PHONE CALUMET 4362

Alden J. Breaux, formerly division sales supervisor of the New Iberia, La., office of the United Gas Corp., has been appointed manager of the DeRidder, La., branch of the company, according to an announcement made by **E. M. Cannon,** district manager.

• •

L. W. Ewing, formerly manager of the New Braunfels, Texas, office of the United Gas Corp., has been appointed manager of the Gladewater office of the company. Mr. Ewing succeeds **B. D. Bruyere,** who was recently transferred to the Kilgore office.

• •

J. H. Knowles, who has been an employee of the Magnolia, Ark., branch of the Arkansas-Louisiana Gas Co. for the last eight years, has been appointed manager of the Bernice, La., district of the company.

• •

W. J. Pead, Jr., chief engineer of the gas department, Montreal Light, Heat and Power Co., Montreal, Quebec, was elected president of the Canadian Gas Association at the Association's annual convention in Hamilton, Ontario, recently. Other new officers include: **Frank D. Howell,** Dominion Natural Gas Co., Ltd., Brantford, first vice president; **Alan H. Harris, Jr.,** Winnipeg Electric Co., second vice president; and **George W. Allen,** Toronto, was re-elected secretary-treasurer.

• •

Clark Bros. Co., Inc., of Ilean, N. Y., manufacturers of gas engines and engine-driven compressors, have announced a change in address of their Pacific Coast office and warehouse and the appointment of **A. K. Hegeman** as West Coast manager.

Mr. Hegeman is a graduate of the University of California college of mining engineering. Following his graduation he served in the World War as a lieutenant in the U. S. Field Artillery. In 1923 he became sales manager for the Cochise Rock Drill Co., of Los Angeles. The following year he entered the employ of the Smith-Booth-Usher Co., of Los Angeles, where he has since been engaged in oil field sales work. The Smith-Booth-Usher Co. has been Clark's Pacific Coast representative for the past 10 years, and Mr. Hegeman has had wide experience in selling, installing and servicing Clark engine and compressor installations.

Clark's new sales office and warehouse are located at the plant of the Pacific Pump Works, Bicket Street and Slauson Avenue, Huntington Park, Calif. A service department is maintained, carrying a complete stock of repair parts with **Art Rowe** in charge.

• •

Announcement has been made that **Colonel W. F. Rockwell,** president of the Pittsburgh Equitable Meter Co. and the Merco Nordstrom Valve Co., Pittsburgh, Pa., has been appointed a National Councillor of the Chamber of Commerce of the United States to represent the Association of Gas Appliance and Equipment Manufacturers.

• •

Gov. Murray D. Van Wagoner has named **Don McGowan,** advertising manager of Consumers Power Co., as chairman of the business and industrial relations division of a state information committee which is to serve as an advisory agency to the Michigan Defense Council.

Additions to the Robertshaw Thermostat Co.'s sales-engineering staff were recently announced by **T. T. Arden,** sales manager. Following a training course in laboratories and plants located in Pittsburgh, Pa., Youngwood, Pa., and St. Louis, **W. D. Mastin** was appointed manager, southern division, and **John B. Selover** sales engineer, Chicago, Ill.

• •

Dr. Curtis L. Wilson, for the past 13 years professor of metallurgy and head of the metallurgy department at Montana School of Mines, has been appointed dean of the Missouri School of Mines and Metallurgy.

• •

Henry D. Lauderdale, of Mercedes, Texas, has been named oil and gas chief of the attorney general's department in Texas. He succeeds **James P. Hart,** of Austin, who resigned. The new director is a graduate of Vanderbilt University, and practiced law from 1934 until his recent appointment.

• •

Charles C. Barnett, assistant district engineer with United Gas Pipe Line Co., Wichita Falls, Texas, has reported for service in the U. S. Army at Camp Robinson, Arkansas.

• •

William J. Layland has been appointed general superintendent of all Gas Service Co. properties operated from the Hiawatha, Kan., office. He is being transferred to Hiawatha from Falls City.

• •

George W. Brinkley, district manager of the Oklahoma Natural Gas Co., has announced the appointment of **Miss Ruth Locke** as home service director of the Ardmore (Okla.) district. Miss Locke replaces **Miss Jean Thompson** who resigned recently.

READY and WILLING to Serve!
MODERN GAS APPLIANCES
RELEASE WOMEN TO DO THEIR PART IN...
PRESERVING AMERICA'S FREEDOM
Arising TO THE OCCASION!
MODERN GAS APPLIANCE HELPERS
GIVE HOME-MAKERS EXTRA TIME
TO DEVOTE TO Our COUNTRY'S WELFARE
WITH MODERN GAS APPLIANCES
WORK IS EASILY DONE...
Giving MORE TIME TO HELP OUR COUNTRY!

New Times Call for New Sales Methods

These Gas Displays show the results of many years of effective Gas Utility Advertising. They prove that the millions of modern time and labor-saving Gas Appliances now capably serving in American homes give "home-makers needed leisure to devote to our Country's Welfare" now that their help is badly needed. These displays have the approval of all patriotic groups in the communities you serve. Use coupon below, or your purchase order for immediate shipment. And, you'll be cooking with GAS, too. Bishop Publishing Company, Chicago, Illinois.

(GB41-10)—Gas Background Displays (two 14¾" x 42" two-way cards, with stands).

(J41-10)—Gas Jumbo Display (one two-way card, 29½" x 42" with stand).

BISHOP PUBLISHING COMPANY, 155 East Superior Street, Chicago, Illinois

Gentlemen: Please ship us the following two-way displays on heavy cardboard.

.....Sets GB41-10 Gas Background Displays.

.....J41-10 Gas Jumbo Display.

.....J41-9 "Now You're Cooking With Gas" Jumbo Display.

.....Sets GB41-9 "Declare Your Independence" and "You'll Really Go To Town" Gas Background Displays.

Prices, f.o.b. Chicago. 1 to 3.....$4.90 each
4 to 7.....$4.80 each, 8 or more.....$4.70 each

Company.....

Address.....

City and State.....

By.....Title.....

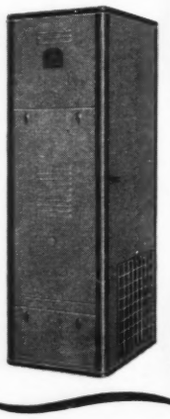
Experience
BUILDS PACIFIC HEATING
Quality
SELLS IT EVERYWHERE!

Quality makes—and keeps—gas users . . . satisfies more customers . . . sells more products.

That is why PACIFIC heating and ventilating equipment is built to only one standard of quality—the highest. In every type, size and model of PACIFIC equipment, this assurance of quality — of topmost efficiency — of low cost operation is a valuable asset that costs nothing extra, yet goes a long way toward building satisfaction and repeat sales.

PACIFIC has had 28 years of experience in the design and manufacture of heating equipment for residential, industrial and commercial use. This wide experience in solving all types of heating and ventilating problems has made PACIFIC an unquestioned leader in the gas appliance industry . . . insures in PACIFIC equipment the most advanced and completely engineered units available today.

Streamlining and beautifying home equipment has influenced today's methods of architectural treatment. Now . . . color, beauty, convenience, efficiency, economy and comfort are demanded. Illustrated here is a Forced-Air Furnace that successfully meets these demands in providing modern heating and ventilating requirements. Equipped with newest features, it is the symbol of quality and guaranteed satisfaction.



Write *today* and ask for details on how you can put this PACIFIC equipment to work building profits in *your* business.

Address Dept. G-941

Pacific
GAS RADIATOR CO.
HUNTINGTON PARK, CALIF.

Obituaries

Floyd W. Parsons

Floyd W. Parsons, 61, vice president of the Robbins Publishing Co. and editorial director of *Gas Age, Industrial Gas, Gas Appliance Merchandising* and *LP-Gas Merchandising*, died August 7 in New York. He was associate editor of *The Engineering and Mining Journal* from 1907 to 1910 at which time he became editor and founder of the publication, *Coal Age*, a position he held for eight years.

During the last 20 years, Mr. Parsons contributed many articles to such publications as: *World's Work, Advertising & Selling* and *Laundry Age*. In the World War he was assistant to United States Fuel Administrator Harry A. Garfield and for five years after the was conducted a series of articles in *The Saturday Evening Post* under the heading "Everybody's Business."

A graduate of Lehigh University, and author of "American Business Methods," 1921, and "Everybody's Business," 1923, Mr. Parsons was a member of the American Gas Association, American Institute of Mining and Metallurgical Engineers, Mining and Metallurgy Society of America, Academy of Political Science, Rocky Mountain Coal Mining Association, the Dutch Treat Club, and the Authors League of America.

• •

John J. Burns

John J. Burns, 66, former investment manager of the Laclede Securities Co. and retired commercial manager of the Laclede Gas Light Co., with which he was associated for more than 40 years, died August 13.

Mr. Burns, who entered the utility field as an employee of the St. Louis Gas Co. prior to its merger with Laclede in 1890, was widely known in the gas industry, having been a member of the advisory council of the American Gas Association and for two years chairman of the Association's commercial section. He retired in 1933.

• •

C. F. Carter

C. F. Carter, operations manager of the Nashville Gas and Heating Co., Nashville, Tenn., died August 20. Mr. Carter had been with the company since 1919 and has been operations manager for the last 10 years. Following his graduation from Alabama Polytechnic Institute, Mr. Carter became an employee of the United Gas Improvement Co. During the World War he served as first lieutenant in chemical warfare. He was a member of the Executives Club, the Nashville Engineering Association and the Exchange Club.

• •

L. O. Ripley

L. O. Ripley, 64, former president of the Kansas Gas and Electric Co., Wichita, Kan., passed away July 22, in Wichita, Kan. Mr. Ripley was stricken with paralysis a few days before his death. He came to Wichita in 1909 from Schenectady, N. Y., to become vice president and general manager of the newly organized Kansas Gas and Electric Co., and served as president of the company from 1933 to 1940. He has acted as adviser and consultant to the company for the last year.

Joseph Putnam O'Neill

Joseph Putnam O'Neill, employee of the Northwest Cities Gas Co., Walla Walla, Wash., and active in the gas industry for the last 30 years, died August 6. Mr. O'Neill was first employed by the Portland Gas and Coke Co. in 1911. Later he was sales manager of the El Paso Gas Co., manager of the Northwest Cities Gas Co., Astoria, Ore.; district manager of the Lewiston, Idaho, branch of the company; manager of the Pendleton, Ore., office and most recently an employee in the general office in Walla Walla, Wash. He was elected a director of the company in 1933.

• •

James W. Ramsey

James Wallace Ramsey, 72, oil and gas operator of Huntington, Ohio, was killed in an automobile accident near Barboursville, W. Va., August 6. Mr. Ramsey had been in the oil and gas business since 1898. He was a senior member of the drilling firm of J. W. Ramsey & Sons, and was president of the Fairfax Oil and Gas Co., Huntington; president of the Brammer Gas Co., Gretaway, Ohio, and president of the Meade Gas Co., of Warfield, Ky.

• •

William R. Williams

William R. Williams, 58, production foreman of the Consumers Gas Co., Reading, Pa., died on April 29, following an illness of several months. Mr. Williams joined the company in 1903 and was in turn, gas maker, assistant production foreman, and production foreman. He succeeded his father in his last position.

• •

Meredith N. Bailey

Meredith N. Bailey, 62, assistant manager of the American Meter Co.'s plant in Philadelphia died July 24. Mr. Bailey joined the Keystone Meter Co. in 1909 and was with that organization when it was absorbed by the American Meter Co. and continued working for the latter concern. A member of the Pennsylvania Gas Association, Mr. Bailey had been assistant manager since 1935.

• •

S. Edward Hager

S. Edward Hager, gas sales department, United Engineers & Constructors, Inc., and former employee of The United Gas Improvement Co., died at his home in Philadelphia on July 23. He was 65. Mr. Hager became an employee of the gas company in 1903 and was with the company until it was separated from its former system.

• •

W. S. Myrick

W. S. Myrick, 78, superintendent of gas distribution for the Memphis Light, Gas & Water Division, died July 27. Mr. Myrick came to Memphis from the Peoples Gas Light and Coke Co. of Chicago in 1903 and has worked for the Memphis utility in various capacities since that time.

• •

Cecil C. Harberson

Cecil C. Harberson, 52, special assistant to George Baird, vice president of the Cities Service Gas Co., Bartlesville, Okla., died July 31. Mr. Harberson had been employed by the gas company for the past 20 years.

IN SAN DIEGO

THERE'S A NEW CITY BORN (*Almost*) EVERY MINUTE

...at least that's the way it seems to our gas meter crews as they receive their daily orders for meter sets

And they're not far from wrong, either, considering the several defense housing projects (each using Natural Gas fuel for heating, water heating and cooking), trailer camps and military cantonments that have sprung up, almost over night, demanding the attention of full-grown cities—and there's more in the offing.

Uncle Sam has just announced another "city" in the Pacific Beach area, and still another in the southeastern part of the city. There's even talk of expanding one of the major projects now complete and occupied.

Yes, business is good in San Diego, and though our problems are many we are meeting them in orderly fashion and keeping pace with private as well as governmental demands for our products.

SAN DIEGO GAS & ELECTRIC COMPANY

CURRENT Reading

General

Labor in the Defense Crisis—T. R. Carskadon, published by the Public Affairs Committee, 30 Rockefeller Plaza, New York. Pamphlet summarizes a survey of the defense labor problem made by a committee of The Twentieth Century Fund, headed by William H. Davis, vice chairman of the National Defense Mediation Board. Without minimizing the seriousness of defense strikes, it points out that strikes have mostly occurred in newly organized industries. It is the 58th of a series of popular, factual, 10c pamphlets published by the committee.

Industrial Research Laboratories of the United States — Compiled under the supervision of Callie Hull; 372 pages; fabrikoid; published by National Research Council, 2101 Constitution Ave., Washington, D. C.; $3.50. Bulletin No. 104 of the National Research Council comprising the 1940 or seventh edition of a catalog of industrial research laboratories maintained by manufacturing and commercial companies in the United States. Data include name, address, officers, research personnel, and research activities, all arranged alphabetically and numbered. Four indexes facilitate access to subjects of research, geographical distribution, personnel, and serial publications of the 2264 laboratories. The book presents information obtained by circularizing 8200 corporations, among them a number of consulting laboratories.

The Constitutional, Legislative and Judicial Growth of Oil and Gas Conservation Statutes—By Leslie Moses, formerly of the New Orleans, La., Bar, now attorney for the Fohs Oil Co., Houston, Texas. A monograph on the growth of oil and gas conservation statutes written by Mr. Moses for the Mississippi Law Journal. Reprinted from the Mississippi Law Journal, Vol. XIII, No. 3, March, 1941.

Conserving Men, Money, and Materials in Essential Industries—A report issued by the Industrial Safety Section of the Metropolitan Life Insurance Co., which is basically a discussion check list for the industrial executive concerned with emergency production. The report lays particular stress on the proper consideration of accident costs. As an aid to the study of industrial accidents and to suggest proper means for their control, the report briefly develops several fundamental considerations for employee safety. Copies are available to executives who address the Bureau on their business stationery. Address Policyholders Service Bureau, Metropolitan Life Insurance Co., One Madison Ave., New York, N. Y.

Oil and Gas Field Development in U. S., 1940 — Edited by W. E. Tracy and E. J. Raisch; cloth; 664 pages; tables and maps; published by National Oil Scouts and Landmen's Association, Austin, Texas; gratis to members.

This 1941 yearbook is the eleventh of the National Oil Scouts. Prospecting, leasing, drilling, and development are covered for virtually every county in the United States where these activities took place in 1940. Acreage of land under lease, and amount and type of exploration work undertaken, by companies; structures revealed by significant wildcat wells; number of wells drilled, by counties; and complete details of all fields in each state are given. Field details include discovery date, number of sands, average depth, the producing formations and structure, discovery method, proved and estimated total acreage, depth of deepest tests, total wells drilled and number in 1940, number of producing wells, and complete production data.

1941 Minerals Yearbook—By The Bureau of Mines. Reviews the progress and developments in the mineral industries during the last year. An authoritative reference on the United States' and world production, distribution, trade and consumption of minerals. Provides public and private agencies in national defense activities with a factual basis for policies, programs and action. Gives special consideration to minerals vital to the defense program. Prepared by nationally and internationally known specialists in the field of mineral economics and technology, under the direction of E. W. Pehrson, Chief of the Economics and Statistics Branch, Bureau of Mines—includes data on more than 100 minerals; 1459 pages; 72 chapters; 97 figures; and a complete index. Copies may be obtained from the Superintendent of Documents, Washington, D. C. The price is $2.00.

Economic Factors Affecting Industrial Relations Policy in National Defense — by Dr. Sumner H. Slichter; 112 pages; cloth; tables; published by Industrial Relations Counselors, Inc., Rockefeller Center, New York; $1.50. Second monograph (sequel to "Economic Factors Affecting Industrial Relations Policy in the War Period") prepared for the purpose of aiding business executives to guide industrial relations policy in a defense situation. Covers defense costs, labor requirements, cost of living, labor shortages, training problems, strikes and labor organizations, trade agreements, and union-management cooperation. A helpful summary indicates that the war and defense program are likely to dominate the American economy, suggests that the defense program will require nearly 6,000,000 men, questions whether standards of living generally can be improved by defense business, warns that living costs will rise if defense is financed too largely by inflationary deficits, outlines problems created by the Fair Labor Standards Act, and recommends expansion of re-

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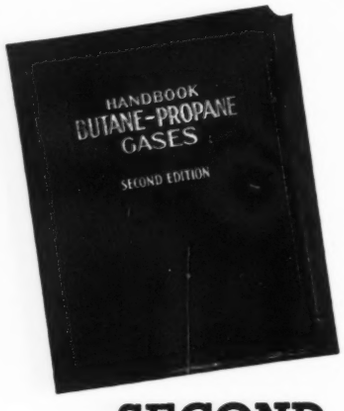

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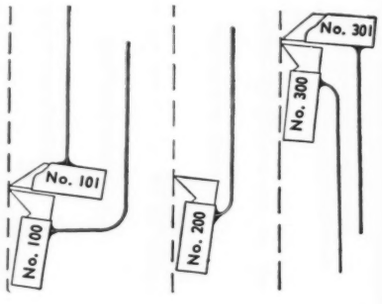

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Job Evaluation and Merit Rating — By Eugene J. Benge; 138 pages; loose-leaf; flexible fabrikoid; graphs, forms, and charts; published by National Foremen's Institute, Inc., Deep River, Conn.; $7.50. Detailed exposition of modern methods of job evaluation and impartial establishment of wage rates, with specific instructions for applying the procedures to any organization or industry. Part I considers the history of job evaluation and the practical operation of various methods, then makes application of the findings. Part II is concerned with merit rating as applied to hiring, training, transfer, promotion, etc. The volume, based upon the author's 20 years of experience in the field of industrial relations, represents a valuable contribution to the understanding of human relationships within industry. It suggests methods first for reaching fair and defensible wage and salary rates and then for recognition of abilities and accomplishments in such a way that progressive employees can see tangible rewards in the future.

Technical

Telemetering, Supervisory Control, and Associated Circuits — By the American Institute of Electrical Engineers. Corrected to December, 1940, the report summarizes information concerning the electric telemetering and supervisory-control systems currently in use or commercially available in the United States, and includes a discussion of the interconnecting circuits suitable for such purposes. Telemetering and supervisory-control equipment, although electrical developments, are finding a great potential field of application in non-electrical industries. In gas, water, oil, and other industries this equipment is playing a vital role in remote metering, indication, or control of the levels, pressures, temperatures, flows, etc., of liquids, gases, etc. Tabulations giving comparative data enable a user of telemetering or supervisory-control equipment to determine the type of apparatus best suited to his requirements. The publication, a 28-page pamphlet, may be secured from AIEE headquarters, 33 West 39th Street, New York, N. Y.; price is 40c a copy to members (80c to non-members).

Handbook of Chemistry — By Dr. Norbert Adolph Lange; 1935 pages; fabrikoid; tables and charts; published by Handbook Publishers, Inc., Sandusky, Ohio; $6.00. Fourth edition of a helpful handbook published first in 1934 for the convenience of practicing and student chemists and subsequently revised, enlarged, and modernized as a reference volume in laboratory work, manufacturing, minerology, dietetics, patent law, bacteriology, medicine, physics, and other fields. Among the 3000 entries in the 35-page index are data on synthetic rubbers, trade names of chemicals, balanced equations, nonenclature, formulas, solvents arranged by boiling points, analysis and tests, conversion factors, definitions, etc.

Petroleum Development and Technology, 1941—Published by the American Institute of Mining and Metallurgical Engineers, 29 West 39th St., New York; 587 pages; cloth; charts; line-drawings; tables; $5.00. Volume 142 of the transactions of the Petroleum Division of the AIMME, presenting papers and discussions from 1940 meetings at New York, Los Angeles, and Tulsa, with petroleum statistical reports for the year. The six chapters are concerned with production engineering, engineering research, petroleum economics, production, education, and refining.

Proceedings of the American Recycling Association — A 90-page booklet containing the proceedings of the American Recycling Association held in Kingsville, Texas, last November in cooperation with Texas College of Arts and Industries. Many charts and tables accompany the subject matter which is divided into four general divisions: Methods of Condensate Recovery, by Henry Wade, of Parkhill-Wade, Los Angeles; Deviation of Natural Gas from Boyle's Law, by George Granger Brown, professor of engineering, University of Michigan; Physical Properties of Hydrocarbon Mixtures in Condensate Production, by F. H. Dotterweich, associate professor of natural gas engineering, Texas College of Arts and Industries, and Frank V. L. Patten, Director of Production, Oil and Gas Division, Railroad Commission of Texas; and Gas Hydrates, by Dr. O. L. Roberts, of the research department of the Atlantic Refining Co.

Geodynamic Prospecting for Oil or Gas —By S. J. Pirson, *Petroleum Engineer*, Midyear, 1941, pp. 34-38. It appears to date that geodynamic prospecting holds great promise of being a fast reconnaissance tool particularly for stratigraphic pools. A certain number of limitations now exist such as the inability to work in water-saturated soils. This may, however, be remedied if a more expensive field procedure is used. The method further depends on the application of the theory of potential functions to the interpretation of the results and, as such, has a certain number of limitations, inherent to such methods particularly in defining the exact producing limits of an accumulation. It has, however, the advantage of being a direct method for finding oil and gas pools under pressure and to indicate their presence by a single set of high readings made immediately above the accumulation. Depth predetermination and separation of individual horizons is also possible within reasonable limits.

Useful Products From Natural Gas — F. H. Dotterweich. *Refiner*, May, 1941, pp. 57-62. Growth of the natural gasoline industry has made available increased amounts of by-product natural gas which has been marketed as a fuel and source of energy and more recently as a chemical raw material from which many useful products may be manufactured. These products include: synthetic rubber, plastics, 100-plus octane fuel, and many chemical raw materials essential in modern industry. These products which may be produced from natural gas may play an important role in the future development of our country, in that they may be used in the construction of equipment for the armed forces, and they may be used in consumer products to replace strategic metals necessary in other fields.

Air and Gas Compression — By T. T. Gill. Published by John Wiley and Sons, Inc., 1941. This book deals with the properties of gas in regard to compressibility, critical data and specific heats, as applied to the solution of the problem of air and gas compression.

I. C. 7150—By G. M. Kintz. Information on the Causes and Prevention of Fires and Explosions in the Petroleum Industry.

Oklahoma Commission Orders Repressuring by Natural Gas

THE Oklahoma Corporation Commission held, July 28, that in order to properly develop the North Burbank oil and gas field in Osage and Kay counties, Oklahoma, and insure the greatest ultimate recovery of oil, a program should be followed which will eliminate the vacuum method of secondary recovery and substitute the injection of natural gas into the reservoir.

The order directs that the use of vacuum shall be discontinued in the production of oil except when, in the proper operation of the gas gathering systems, it is necessary from a practical standpoint to "pull not to exceed two points." The order further tsates that, "on all wells in which vacuum is being applied the operator shall reduce vacuum one point per month until it is entirely eliminated."

A hearing was held and the order was issued pursuant to a complaint filed by T. B. Hall, superintendent of the Osage Indian agency, protesting against the use of the vacuum method in the North Burbank oil field. The North and South Burbank oil fields cover about 28,000 acres. At present there are 2149 wells in the fields, 1851 of which are producing oil, 296 being used for natural gas injection and 22 for salt water disposal.

Repressuring in the North Burbank field by use of gas started in 1929, but vacuum has been applied in varying degrees throughout that field. In the South Burbank field, discovered in 1934, operators started injection of a large part of the natural gas produced. Approximately 60% of the gas produced there now is being re-injected. Many wells in that geld are still flowing naturally while others are being pumped by means of surface-actuated pumps.

■ ■

Arkansas Natural Gas Corp. To Hold Wrinkle Contest

The Arkansas Natural Gas Corp., Shreveport, La., has decided that a good "wrinkle" is worth money and announced a "Wrinkle Contest" in a recent issue of *The Expanding Circle*, company magazine.

Because of interest shown by gas pipe line department employees in making devices to simplify their work, it occurred to W. H. Buckley, superintendent of that department, that a contest might bring out many worth-while wrinkles.

Mr. Buckley says the purpose of the contest is: "To make suggestions and ideas of any one district available for employees throughout the gas pipe line system." The contest is to be conducted on a semi-annual basis—all entries to be in by Jan. 1, and July 1.

The employee submitting the best wrinkle will receive a first prize of $10, and the second best entry will merit a reward of $5. A winkle may consist of any suggestion which will make the department's operation "*safer, simpler* or more *efficient*."

■ ■

F.P.C. Permits Intervention Of Michigan Consolidated

The Federal Power Commisison has announced that Michigan Public Service Commission is permitted to intervene in the proceeding involving the complaint of the Michigan Consolidated Gas Co. against Panhandle Eastern Pipe Line Co. and Michigan Gas Transmission Corp. that they are granting preferential rates.

Michigan Consolidated Gas Co., which distributes natural gas to Detroit and vicinity, filed a complaint with the Federal Power Commission alleging that the Panhandle Eastern Pipe Line Co. and Michigan Gas Transmission Corp. are violating Section 4(b) of the Natural Gas Act by granting unduly discriminatory and preferential rates to others, particularly the Consumers Power Co. which serves communities in the interior of the State of Michigan, and causing disadvantages to the complainants and to the public.

■ ■

California Gas Companies File Plan for Merger

Southern Counties Gas Co. and Santa Maria Gas Co. have filed with the California Railroad Commission in San Francisco an application for authority to permit the two companies to merge under the name of Southern Counties Gas Co., according to R. E. Easton, president of Santa Maria, and F. S. Wade, president of Southern Counties.

Under the proposed merger, which is subject to approval of the California Railroad Mommission, the Southern Counties Gas Co. proposes to issue 15,000 shares of its $100 par common stock in exchange for a like number of the $100 par capital stock of the Santa Maria Gas Co. The transmission and distribution systems of both companies are now physically interconnected. Southern Counties Gas Co. has supplied a considerable percentage of the gas used by the Santa Maria Gas Co. Both concerns are affiliated through ownership by Pacific Lighting Corp.

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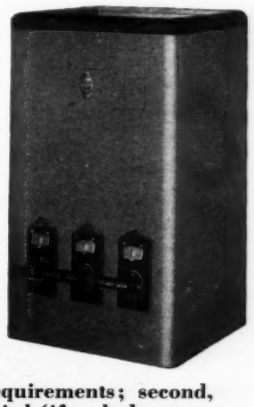

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Gas as Chemical Plays War Role

IN this wartime period the importance of gas in the field of chemistry is revealed in the following quotation from *Saturday Night*, the Canadian publication, which gives a comprehensive idea of the many war-time uses to which natural and manufactured gas can be put.

"By hydrogenating mineral oils a set of aviation gasolines and lubricants emerges.

"Ammonia for natural gas either fertilizes a farmer's soil or keeps the fruits he grows cold and good as a refrigerant.

"Acetylene again gives the carbon to power army dry cells sent out by the Red Cross for flashlights winking in British blackouts. Butadiene is another synthetic rubber. Isobutylene is a high-powered auto fuel.

"Until the war began, there was no economic use of nitrogen from gas. Nitrohydroxy compounds are now being transformed by synthesis in Canada to make from natural gas high explosives for shells and cartridges to replace those lost in the Battle of France.

"And for years the formation of oxides of nitrogen wasn't being investigated. Research of direct nitration of methane and ethane resulted by 1935 in successful nitro-compounds. When war began the reaction between nitromethone and formaldehyde has been found to form a base which could be acted on by nitric acid to form nitroisobutyl glycerine trinitrate, an explosive more stable than TNT, with much lower freezing point, now entering heavily into the continuing Battle of Britain.

"From toluene comes TNT itself, trinitrotoluene. Cellophane, thiokol, lumarith, polaroid are new world materials which have come into our ken and remained. Tetraethyl lead from gas is used in seven of each ten autos from here to the Rio Grande. Ether alcohol fuels the tanks of Panzer divisions. Methyl esters dope the wings of British airplanes. Formaldehyde originates in gas and is important in the ultimate worth of every photograph taken over Germany.

"For the cause of mercy there are anaesthetics from gas, choloroform, methylene chloride, ethyl chloride, diethyl ether."

■ ■

Bakersfield, Calif., Utility Receives 50-Year Franchise

The City Council of Bakersfield, Calif.. has granted the Pacific Gas & Electric Co. a franchise giving the company the right to distribute gas within the city limits during the next 50 years or until 1991.

Adopting necessary resolutions approving the company's bid for the $8600 franchise, the council ratified the ordinance which became effective recently.

Defense Aid by Appliance Conservation Is Discussed

THE Consolidated Edison System companies met with manufacturers, distributors, and repairers of gas and electrical appliances on August 20 to discuss a plan for the servicing and repairing of all gas and electrical appliances used on the company's lines. The plan is designed to decrease the demand for new appliances so as to release materials for national defense.

According to E. F. Jeffe, vice president, Consolidated Edison, the plan calls for the setitng up of certified service and repair stations under standard supervised operation, prices and terms. It also will include financing to provide the timely repair of any appliance from an electric iron to a large refrigerator. Dealers now cooperating in the sales campaign sponsored by the company will be invited to take part in the new activity as a means of replacing the income which is expected to be lost to them because of the lack of new appliances resulting from defense needs.

■ ■

Natural Gas is Cooling Unit In New Magnesium Plant

Natural gas is being used in large quantities as a cooling unit in bringing the temperature down quickly from 4000° to 380° in the final processing of magnesium at the new plant in Permanente Creek, in the Santa Clara Valley, Calif. The magnesite ore is mined at Luning, Nev., 100 miles away, and brought to the plant where it is cooked in big rotary kilns to decompose into its two component parts — carbon dioxide, which is wasted, and magnesium oxide. The latter is composed of oxygen and magnesium, and natural gas is used as a cooling unit to get rid of the oxygen. The gas is later used as a fuel.

■ ■

Industrial Gas Increase Is Heavy in Indianapolis, Ind.

In keeping with growing national defense production, the consumption of gas in Indianapolis, Ind., showed a heavy gain in the first six months of this year, according to a report released by the Citizens Gas & Coke Utility recently.

Industrial gas consumption increased 153,000,000 cu. ft. over the comparable period last year. The total gas consumption thus far this year has been 2,486,110,800 cu. ft., an increase of 192,000,000 ft. over last year.

■ ■

Bids Called for Distribution System in Hastings, Neb.

Bids have been called by the city council of Hastings, Neb., for the construction of a municipal gas distribution system expected to cost between $250,000 and $350,000. Estimated contract price for using steel pipe is $234,000 and for using iron pipe, $33,674. F. E. Devlin, of Wichita, Kan., is consulting engineer for the project.

■ ■

Chickasha Cotton Oil Co. Installs Natural Gas Engine

The Chickasha Cotton Oil Co. has installed a 140-hp. Cooper-Bessemer natural gas engine in its cotton gin at Blanchard, Okla. Natural gas is supplied from the lines of the State Fuel Supply Co., Oklahoma City, Okla.

The new gas engine replaces a steam boiler, using coal, and a 125-hp. steam engine.

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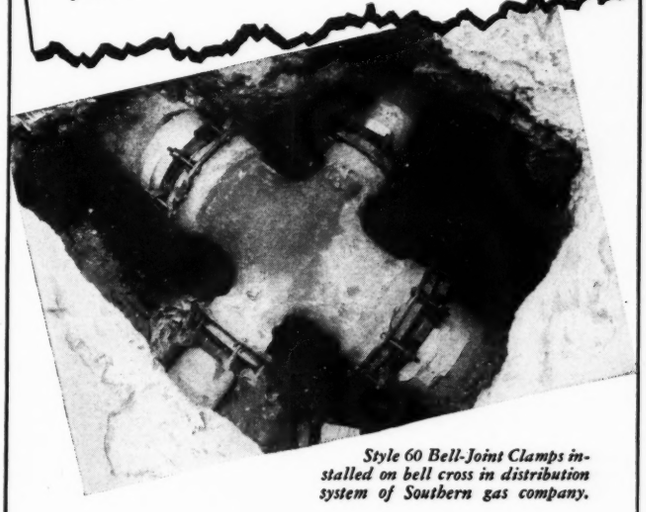

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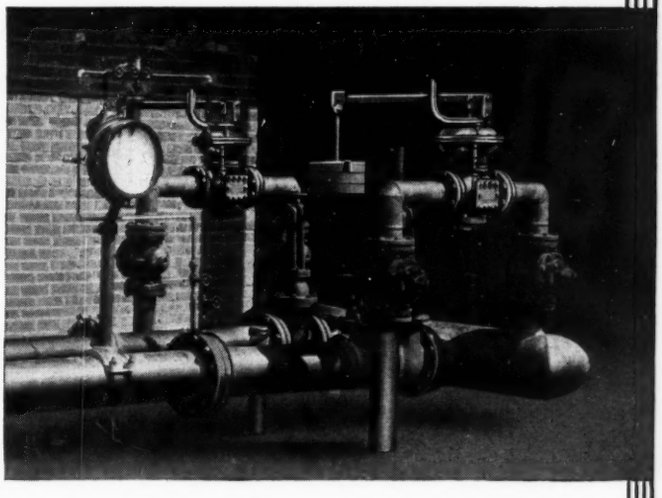

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Skelly Oil Co. to Build Gas Treating Unit in New Mexico

THE Skelly Oil Co., Tulsa, Okla., is planning construction of a 20,000,000 cu. ft. per day soda-ash gas treating unit to be installed at the company's Eunice, N. M., gasoline plant.

Construction is to be completed within five months. The new unit will enable the company to deliver treated residue gas with a hydrogen sulphide content not exceeding 15 grains per cu. ft., to a new carbon black plant to be erected near Eunice by the Columbian Carbon Co. The residue gas now coming from the gasoline plant has a hydrogen sulphide content of 277 grains.

The Skelly Oil Co. also plans to add 1200 hp. to the compressor capacity of its Eunice gasoline plant.

■ ■

15,000,000 cu. ft. Gas Well Drilled in Ohio Clinton Sand

A gas well estimated at 15,000,000 cu. ft. was drilled in recently by the Pure Oil Co. on the farm of Miss Clara Fouts, near McConnellsville, Ohio. The well was struck in the Clinton sand at a depth of 4000 ft.

Texas Southwestern Gas Co. Provides Fuel for Irrigation

TEXAS Southwestern Gas Co., Belleville, Texas, is supplying fuel for two 265 hp. boilers at the Lakeside Irrigation Co. plant. The plant has a capacity of 185,000 gals. per minute and furnishes water for the irrigation of 25,000 acres of rice, which grows in several inches of water for a period of from 90 to 120 days.

Rice lands of Colorado and Wharton counties are supplied with water from this plant through an intricate system of gravity flow canals, totaling some 85 miles in length. The source of the water supply is from the body of water known as Eagle Lake, which is also fed by water from the Colorado river, through another large pumping plant of the Lakeside Irrigation Co.

The plant will use approximately 274,000 cu. ft. of gas per day, and will be operated only during the summer months which is the period when the Texas Southwestern Gas Co. line capacities are not needed for domestic consumption.

■ ■

Properties of Two Iowa Firms Sold to Des Moines Utilities

N. Henry Gellert, president of the Great Lakes Utilities Co., has announced the sale of the Independence Gas Public Utility property to Iowa bond houses. In the sale, the Independence company and the LeMars Gas Co. dispose of all their property in the state by sale to Polk-Peterson Corp. and Carleton D. Beh Co., both of Des Moines.

Due to requirements of the Public Utility Act of 1935, the Great Lakes Utilities Co., parent company of the two utilities, will be forced to dispose of all of its Iowa properties. Transfer of the property took place on August 10. All former employees of the companies with the exception of Nathan H. Gellert, former manager of the Independence company, were retained by the new owners. Mr. Gellert is now vice president of the North Carolina Gas Corp. and in charge of the plant at Lexington, N. C.

■ ■

Cities Service Co. Continues To Supply Union Gas System

The Federal Power Commission has received information stating that an agreement has been reached under which Cities Service Co., of Bartlesville, Okla., will continue to serve the Union Gas System, Inc., Independence, Kan.

A hearing on the subject, set for August 8 at Kansas City, Mo., was postponed indefinitely.

The commission said Cities Service Gas Co. on June 23 filed notice of intention to discontinue service to Union Gas after August 22 under an agreement dated November 10, 1938, and that Union Gas subsequently filed a protest to such cancellation, stating it would affect the public interest adversely.

■ ■

Rate Investigation Ordered For Lone Star Gas Co.

The Federal Power Commission, on its own motion, ordered a thorough investigation into the rates and charges of the Lone Star Gas Co., Dallas, Texas, for natural gas sold for resale to some 280 communities, according to a release from the Commission. Investigation has been ordered into the company's status as a natural gas company within the meaning of the Natural Gas Act.

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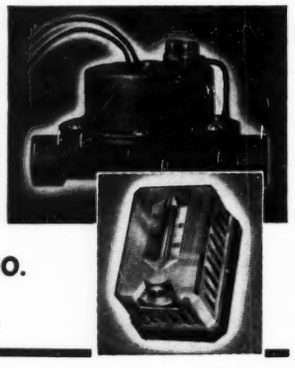

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Montana Oil and Gas Directory Is Compiled

THROUGH a Work Projects Administration project, known as the Montana Mineral Resources Survey, a new oil and gas directory is being compiled to cover the oil, gas, and refining industry of Montana. The last oil and gas directory was published in the early 1920's.

Under the present set-up, simple questionnaires easy to answer, have been sent to the various oil and gas concerns, who are operating or have operated in the last 10 years. A large number of the recipients of the questionnaire have filled it out and returned it to E. Byers Emrick, director of the Oil and Gas Division of the Montana Mineral Resources Survey, Conrad, Mont.

(Anyone who has operated an oil or gas property in Montana during the last 10 years, who has not received a copy of the questionnaire, should immediately write to the Montana Mineral Resources Survey, Oil and Gas Division, Box 395, Conrad, Mont., and a questionnaire will be promptly sent to him.)

■ ■

Most New Petroleum Fields Discovered by Science

Drillers who took the advice of scientists in their search for new oil and gas fields in 1940 were three to four times as successful as the drillers who located their exploratory wells by non-scientific hunches, doodle-bugs, or dreams.

One-tenth of all the wells drilled by the petroleum industry in 1940 were out beyond the limits of present fields — wildcat wells drilled in an attempt to find new fields. One-eighth of these wildcat exploratory wells, 366, were successful, opening up new oil and gas fields; the remaining 2672 were failures—dry holes. Of these wildcats, 2051 were drilled on technical advice—geology, geophysics, or a combination of the two—and 320 of them were successful. Sundry non-technical reasons were the excuse for drilling 832 exploratory wells last year, and only 35 found oil.

■ ■

Defense Contract Service Handbook Is Issued

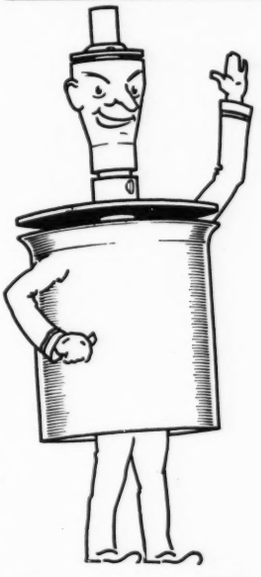
The production division, Office of Production Management, Washington D. C., has issued a handbook on the "Defense Contract Service."

The booklet is an appeal to every American manufacturer to harness the full productive power of his organization for total defense. Through 36 field offices the Defense Contract Service is recruiting every suitable factory—large and small—in the land. Manufacturers who wish to find out what they can do to help can write or go to the nearest regional office. These offices are located at each of the Federal Reserve banks and at the 24 branches of these banks.

■ ■

Lakefield, Minn., Gas System Will Be Completed Soon

According to K. N. Fancher, president of the Minnesota Natural Gas Co., Worthington, Minn., the new gas distribution system to serve Lakefield, Minn., is drawing near completion. Sixty men have been employed recently in digging the ditches for the mains throughout the town. All work has been completed in south Lakefield and officials of the gas company expect the work in north Lakefield to be completed soon.



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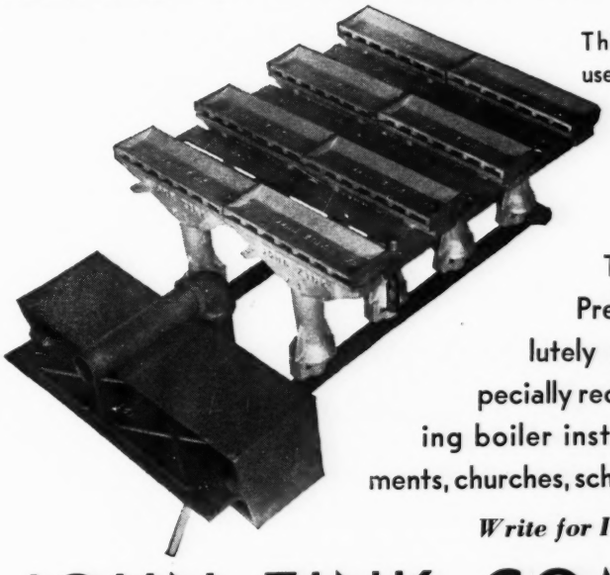

This burner is being used in many National Defense Projects.

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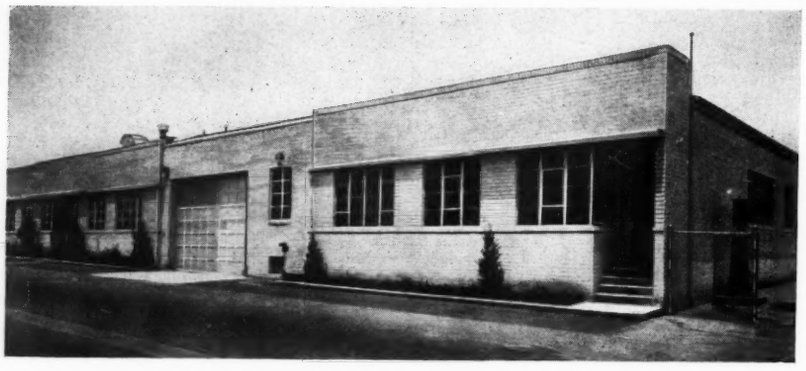

New plant of the American Recording Chart Co., recently enlarged.

ARCCO Acquires Anubis Laboratories

THE American Recording Chart Co., manufacturers of "Arcco" recording charts and in recent years distributors of Anubis instruments, have acquired from the estate of the late Col. George Sydney Binckley, the entire business of the Anubis Laboratories.

In May, 1940, the growth of the company's chart business necessitated the erection of its own building at 3113 E. 11th St., Los Angeles, Calif. To provide precise control over the manufacture of recording charts, the building was air conditioned throughout. An engraving room was provided in which wax engravings are cut. They are used to make the copper plates from which all "Arcco" charts are printed. Storage space for several car loads of special chart paper, a stock room for more than 1,000,000 charts, a battery of especially equipped printing presses and modern office facilities complete the modern building.

The acquisition of the Anubis Laboratories necessitated the enlargement of the present building to include the new laboratory and instrument shop. To provide precise control over calibration of instruments in which humidity is a factor, the air conditioning was extended to the new shop. In this shop, as in the chart department, a modern lighting system has been installed. Individual fluorescent lighting has been placed at each machine and assembly bench. Glare-reducing glass has been installed throughout.

Special testing and calibrating devices are used in the laboratory for testing and adjusting each Anubis instrument before shipment. Machinery has been installed to handle the increasing demand for these instruments.

Under the direction of J. W. Dunn, manager of the American Recording Chart Co., all details of the new buildings have been planned to fit the two types of manufacturing work engaged in by the company. These include "Arcco" recording charts and ink, "Beta" pens, Anubis portable gas balances, recording gas gravitometers, laboratory gas balances, meters and indicators, recording and indicating liquid gravitometers, and viscosimeters.

American Recording Chart Co. is also the exclusive distributor for the Macnick Chart Clock. A recent addition to their line was shown for the first time at the Appalachian Gas Measurement Short Course at the University of West Virginia, August 18-20. This was the new Arcco-Macnick differential unit. The unit offers for the first time a differential recording device using no mercury and is adaptable for use with orifice meter equipment.

■ ■

Community Natural Opens New Offices in Denison

The Community Natural Gas Co., Denison, Texas, recently opened its new office and warehouse at 619 West Main street. The home economics staff of the company was sent from Dallas to serve refreshments and to assist Manager B. A. Mitchell during the public inspection of the building.

The new warehouse is equipped with a three-section overhead suspended door to admit trucks, and the new office building is faced with ivory and black glass bulkheads, trim and columns. The transoms, show windows, doorway and marquee are trimmed in white metal. The ceilings are of smooth finish plaster, forming panels inset with acoustic blocks of herringbone design. Floors are covered with asphalt tile of herringbone design. Fluorescent lighting has been installed throughout the display lobby and offices.

■ ■

Laclede Gas Light Co. Signs New Union Contract

A two-year labor contract was signed recently by The Laclede Gas Light Co., St. Louis, Mo., and the Gas and By-Products Coke & Chemical Workers Union Local No. 12006. The agreement embraces essentially the same provisions as those which have been in effect, with the exception of some wage adjustments for certain groups ranging from 2% to 6%. An added clause provides for a review and adjustment of wage rates during the life of the contract if the living cost index, compiled by the epartment of Labor, shows a 10% increase or a 15% decrease.

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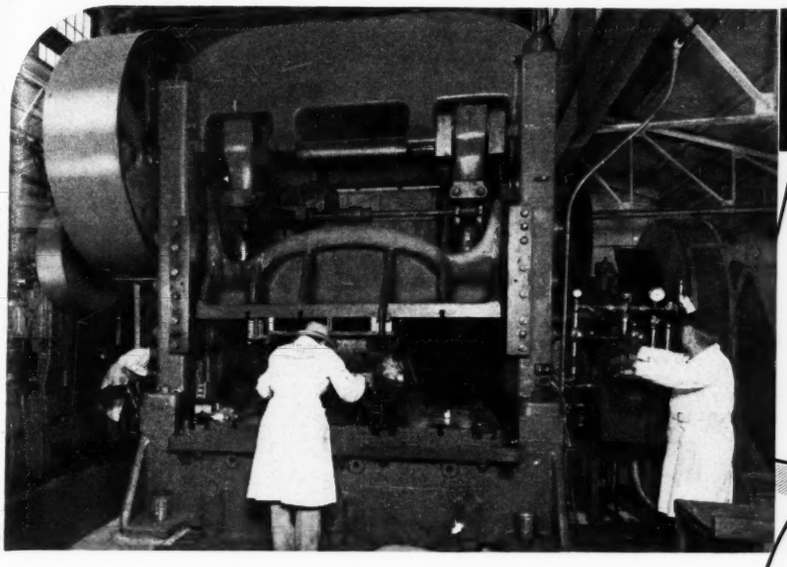

This press, with a capacity of 375 tons, is one of many that make Utility die-formed parts—parts that are uniform, smoothly finished and attractive. This is only one of the many pieces of equipment that give Utility Fan Corporation the largest and most complete sheet-metal facilities in the West.

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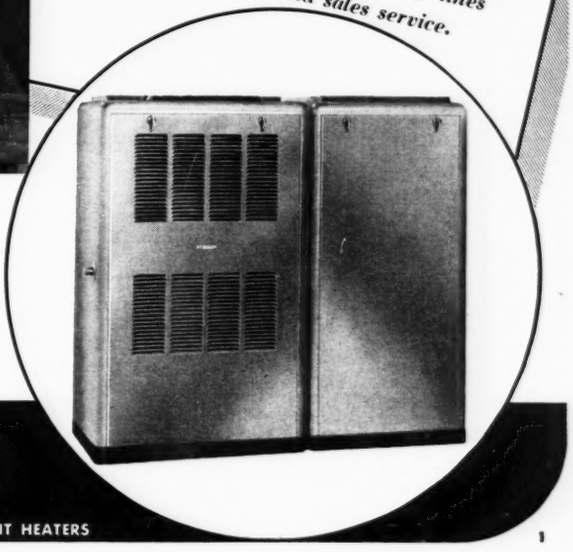

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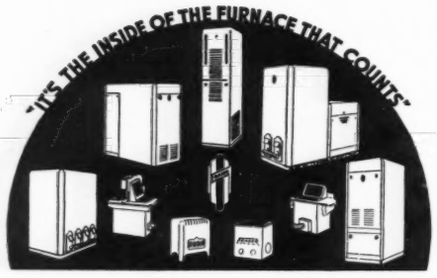

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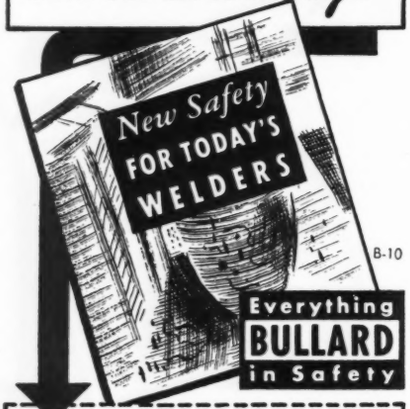

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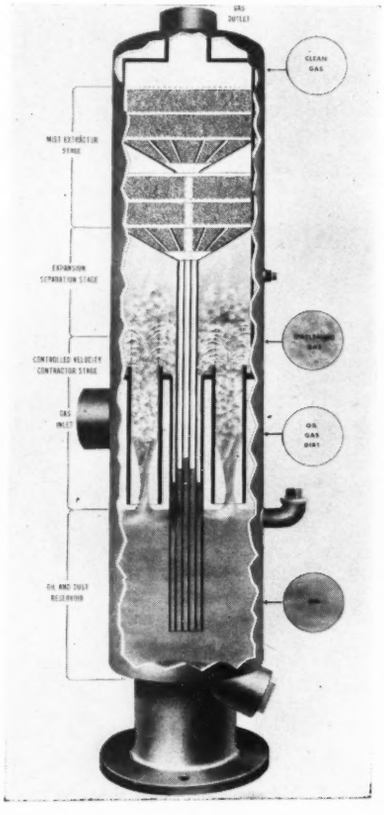
Gas Cleaner

Blaw-Knox Co., Pittsburgh, Pa.
Model: Type "K" Series.
Description: There are a number of new gas cleaners in this series. They are of the low capacity or consumer type suitable for installation in front of a commercial or industrial customer's meter, or to do the gas conditioning for an entire district or at a town border station. One of the series, the



Cut-away drawing of Blaw-Knox gas cleaner.

"K-6L," which will condition 396 000 cu. ft. per day at 30 lbs. gage pressure, costs only $95.00; and the prices for the other units in the series are proportionately reduced.

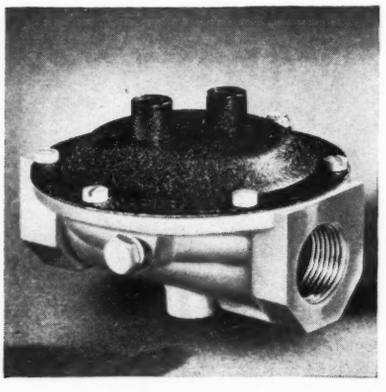
The new series of gas conditioners employ the basic Blaw-Knox method of cleaning the gas. Part of the device forces the intimacy of contact between the gas and the washing liquid. Most of the liquid with the entrained dust particles falls out of the gas in the expansion separation stage, and drains back to the reservoir. The finer drops are removed in the mist extractor stage, where scientifically designed drainage channels allow fast run-off of liquid while forcing the gas to have a maximum contact with the separation material.

Every step in the movement of gas from the inlet of the unit to the delivery of clean gas in the outlet has been tested and checked over a considerable period of time, and the present method of gas conditioning employed in this series represents the culmination of years of development. Further information may be secured by asking for bulletin No. 1824.

■ ■

Diaphragm Gas Valve

General Controls Co., Glendale, Calif.
Model: Series B-101.
Description: Claimed to be the smallest and most compact fail-safe diaphragm gas valve, for successful operation where damper arm control is not needed, these valves are offered for standard I.P.S. as small as ¾-in., and in all other sizes up to 3-in. inclusive. Listed as Series B-101, the new



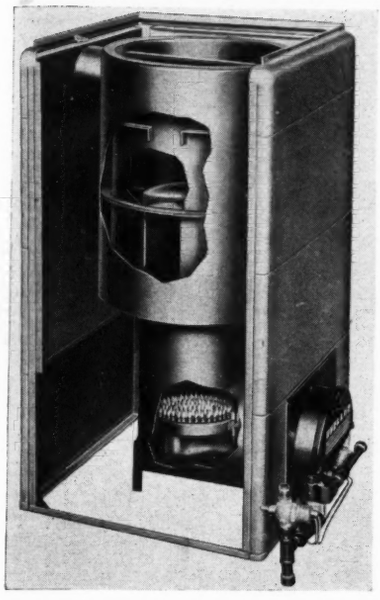
valves embody improvements on the original design listed as B-100. They include internal gas ways and interchangeable orifice as integral parts. The compact design makes these valves adaptable to any type of pilot valve, either direct, reverse or three-way, with positive ability to fail safe upon diaphragm rupture.

The B-101 is available for all liquid petroleum gases as well as natural gas. Maximum operating pressure limited by pilot valves up to 5 pounds. The full range of sizes covers capacities from 160 to 12,000 cu. ft./hr., depending on pressure drop and size of valve.

■ ■

Gravity Furnace

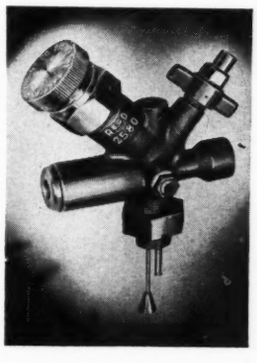
L. J. Mueller Furnace Co., Milwaukee, Wis.
Model: Series "G".
Description: The new gas-fired gravity furnace features an all-welded heavy steel drum and radiator with extra long flue travel. The radiator uses a circuitous travel of the products of combustion which breaks the total volume into four parts and exposes each part to the surface of the radiator, thereby assuring maximum heat transfer and efficiency of operation. The products of combustion travel upward throughout their course, providing freedom from the possibility of condensation collections. The burner and venturi are of one piece



cast iron construction, with raised drilled ports. Unit is available in one size only (90,000 B.t.u. per hour input and 67,500 B.t.u. output). It is available in two styles. The Model GR-90 has a round galvanized casing and pitched hood with inner radiation shield. The Model GS-90 has a square casing with radius corners and green crinkle lacquered finish. It also has a pitched hood and inner radiation shield. The square cased unit measures 66 in. in height, including hood; 20 in. in width and 28 in. in depth. The round cased unit is 67 in. in height, including hood; 32 in. in diameter.

■ ■

LP-Gas Valves



The Bastian-Blessing Co., Chicago, Ill.

Model: RegO 2580 and 2581 LP-Gas Valves.

Description: Designed especially for use with permanently installed ICC cylinders and ASME or API-ASME above-ground containers. They are suitable for use with either flash or batch vaporization. Safety and utility features are: shut-off valve for outlet connection; excess flow check valve for outlet connection; automatic quick filler valve and back pressure check valve; supplementary back pressure check valve; safety relief valve; fuse plug; fixed liquid level gage and vent valve; variable positioning container inlet connection; and liquid eduction outlet tube. Only one connection is required in the container. The RegO 2581 Valves are also equipped with elbow outlet adapters and loose rain caps on the safety relief valve and at the fuse plug discharge.

■ ■

Plans for Carbon Black Plant

The Columbian Carbon Co., New York, is planning construction of a $400,000 carbon-black plant near Eunice, N. Y. The plant's capacity will be 20,000,000 cu. ft. of gas daily.

Over 265 Satisfied
"Carboseal" Anti-Leak *users*

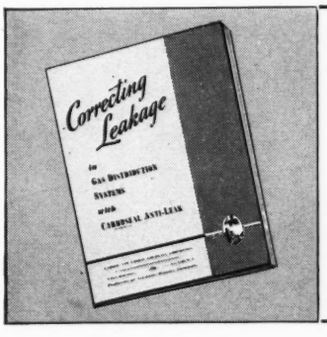
. . . Get Long-Term, Low-Cost Correction of Dry Bell-and-Spigot Joint Leakage

MORE than 265 gas properties the country over are now using "Carboseal" anti-leak treatment to correct packed bell-and-spigot joint leakage in systems distributing dry gas. And they get results! . . . The first three treatments recently applied to one mile of four-inch main reduced leakage 83 per cent. Another 1500 feet of four-inch main treated in the same way showed a leakage reduction of 82 per cent . . . Nine hundred feet of six-inch main treated as a test case showed 100 per cent leakage reduction. As a result, this company is treating and placing in service a number of cast iron mains that had previously been abandoned.

Experience shows that joints treated with "Carboseal" anti-leak keep gas inside the main and stay tight indefinitely. Joints treated eight years ago are still tight today on the soap test . . . And the cost of this treatment is surprisingly low. The average of the actual costs of 16 users who treated over 200 miles of main was 50 cents per joint.

In addition, "Carboseal" anti-leak treatment saturates dirt and rust lying in the main, holding it in place and preventing it from being carried into customer appliances.

You too can do what over 265 satisfied users have already accomplished with this accepted method of reducing unaccounted-for gas loss. Plan now to start using "Carboseal" anti-leak treatment in *your* system.



Send for this Book

This 20-page book tells more about "Carboseal" anti-leak treatment—how it can be applied by either the gravity or the hose method, what equipment is needed, how much the treatment costs, and what results can be obtained. A request on your company letterhead will bring you a copy, without obligation. Write for *your* copy *now*.

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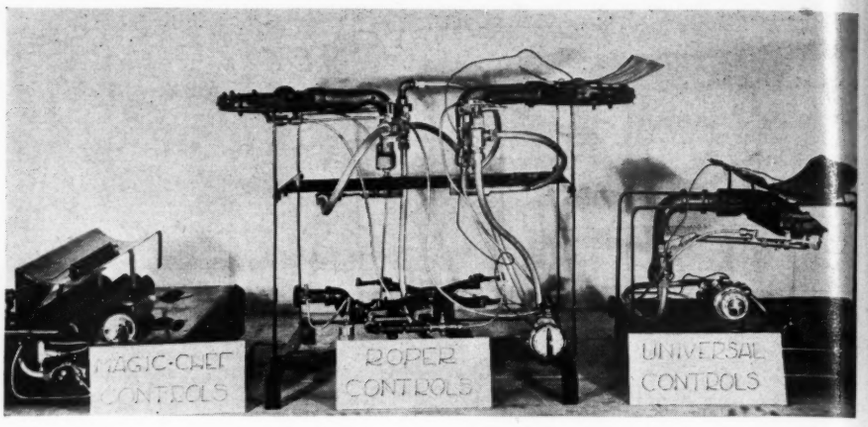
Sheepwagon Schoolhouse Uses Natural Gas

THE white canvas dome of the sheepwagon is a familiar sight on the Wyoming plains, but there is probably none other in the world like the one which is the home of Miss Kathryn Mills, teacher of the Empire Oil school. One of Natrona county's rural schools, it is situated in an isolated prairie county west of Casper. Wyo.

This sheepwagon, however, is unique in having refinements that these prairie homes seldom if ever possess. It is equipped with natural gas for heating and cooking. The small settlement where the school is located lies adjacent to the Northern Utilities Co. main gas line that serves cities and towns in central Wyoming and Western Nebraska. The gas comes from the Big Sand Draw and Muskrat natural gas fields 75 miles away, and is secured by a tap in the main line.



W. J. Gehr, superintendent of the gas distribution department of the Wisconsin Public Service Corp., Sheboygan, Wis., recently built this skeleton demonstration model to aid service men of the company in studying the action and controls of Magic Chef, Roper and Universal gas ranges.

Gas Range "Skeletons" Aid Servicemen

A NOVEL, yet clearly understandable skeleton model, duplicating the controls on the inside of Magic Chef, Roper and Universal gas ranges, has been built by W. J. Gehr, superintendent of the gas distribution department of the Wisconsin Public Service Corp., Sheboygan, Wis. (See photo on this page.) The company's practice has been to take an appliance, tear it down, see how it was constructed and how it operated, so that servicemen would be thoroughly familiar with the equipment and would be better able to service it.

The construction of gas ranges made it difficult to see how the controls worked and so to obviate the necessity of taking a stove apart, Mr. Gehr worked out the model shown above for use in gas appliance service schools which he is conducting in the company's various gas communities. Servicemen are thus enabled to see the action of the apparatus, get it out of adjustment and then readjust it, and observe how high pilot tips should be burning for most efficient operation.

This demonstrator is said to be the first of its kind. Stove companies have been considering something along this line for some time but found it practically impossible to work on the apparatus because of the large number of orders they had on file. These three manufacturers cooperated in supplying the necessary equipment, however, and are very much interested in Mr. Gehr's model, having requested photographs of it for the information of other utilities, as well as the use of the equipment when he has finished with it, since they feel he has made a worthy contribution to gas range servicing.

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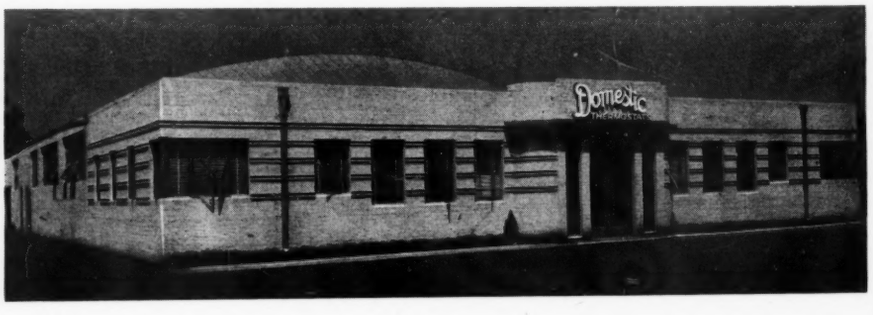

Domestic Manufacturing Co. Builds Los Angeles Plant

One of the outstanding features of the new plant building recently erected by Domestic Manufacturing Co., Inc., Los Angeles, is that it uses gas for power, while it utilizes the exhaust heat from its engine-generator installation for heating the plant in winter and also for heating water for showers and washrooms.

Three shifts a day are in operation to provide for the demand for domestic thermostats for defense as well as civilian requirements. The use of thermostatic controls on gas appliances is recognized as of definite value in conserving our gas supply, since they eliminate the possibility of turning appliances on and going away and forgetting them, thus wasting fuel. This is indicated by the fact that orders for heating equipment for army camps specify automatic controls.